

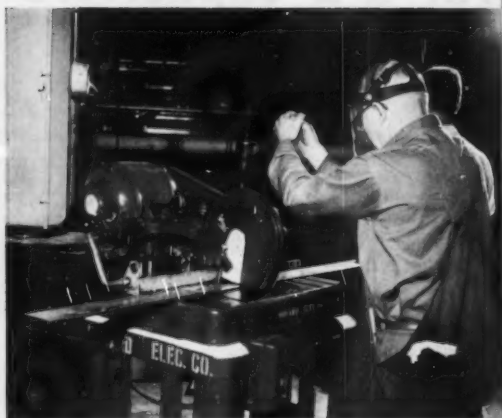
# ELECTRICAL CONSTRUCTION AND MAINTENANCE

SEPTEMBER • 1954

PRICE 35 CENTS

WITH ELECTRICAL CONTRACTING

Transilluminated plastic  
and sound absorbing  
wedges mask old ceiling  
in factory to office conver-  
sion project . . . page 76



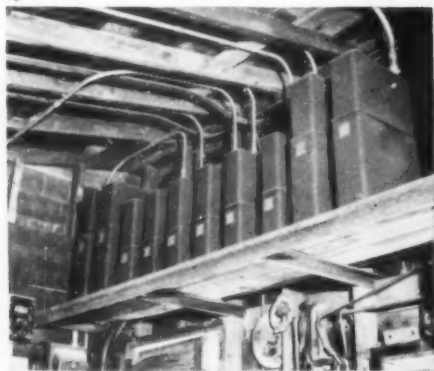
Power tooling cuts costs of  
on-site bus fabrication and  
installation . . . page 72

A MCGRAW-HILL PUBLICATION

**53**<sup>RD</sup> YEAR

**VOLTAGE REGULATION**, one of the benefits from using G-E Capacitors, assures top efficiency and long life from motors (right) driving conveyors and crushers at Dubuque Stone Products Co., Dubuque, Iowa.

**OUT OF THE WAY** on rack in switching house, bank of G-E Capacitors for conveyor motors are part of installation totaling 140 kvar. Others are mounted at load. All assure longer motor life.



## Stone Products Company cuts power bills, improves voltage with G-E capacitors

**Dubuque Stone Products Co. raises power factor from 66% to 99%—  
power-bill savings pay for installation in less than a year.**

Power factor at Dubuque Stone Products Co., Dubuque, Iowa, jumped from a 66% average to 99% when G-E capacitors were installed. As a result, they're taking advantage of all the power they're paying for. Capacity has been increased without new transformers or wiring. Improved voltage regulation has brought efficient motor operation for longer, more economical motor life.

Total cost including installation was \$1,830.57. "And they'll more than pay for themselves out of power-bill savings during the first year," reports Mr. Paul Nauman, general manager of the company. G-E

Capacitors will continue to save in the same way for many years more.

Low power factor may be costing you money. Investigate your electric power contract to see if there's a kva-demand or power-factor clause. Find out how you can start saving with G-E Capacitors by calling your nearest G-E Apparatus Sales Office or authorized agent. Ask for a copy of "How to Use Capacitors to Reduce Power Costs," or write for bulletin GEA-5632, to Section 441-105, General Electric Company, Schenectady 5, New York.



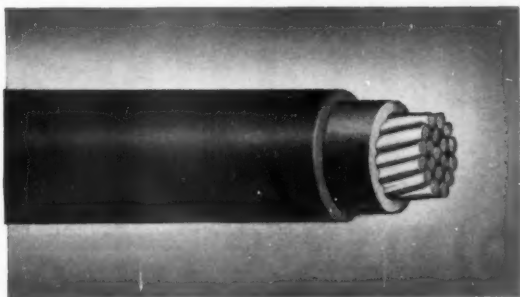
*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

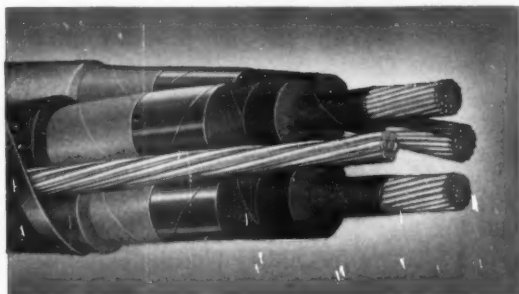




# 10 reasons why you should specify, buy, install U. S. GRIZZLY® POWER CABLES



U. S. Grizzly Power Cable, 600 volts — Type RR single conductor, Hydrosec® — S heat- and moisture-resistant insulation, Neoprene jacket.



U. S. Grizzly Power Cable, 5,000 volts — Type RR — 3-conductor, Uskorona® — ozone-resistant insulation — shielded — Neoprene jacket.

1. Lighter in weight than lead-sheathed cables and lead-sheathed armored cables.
2. Greater flexibility
3. Easier to handle during installation
4. Easier to splice, tap and terminate
5. More resistant to chemical corrosion
6. Unaffected by stray currents
7. Better protection against weathering
8. Longer life
9. Cost less
10. Made by United States Rubber Company, the *only* electrical wire and cable producer to grow its own natural rubber, make its own synthetic rubber and manufacture its own plastics

U. S. Grizzly Power Cables are used for general power distribution, and can be installed in conduits, underground ducts, buried directly in the ground, or installed aerially. Neoprene jacket protects against acids, alkalies, oils, and mechanical damage and weathering. (All IPCEA and NEMA specifications complied with.)

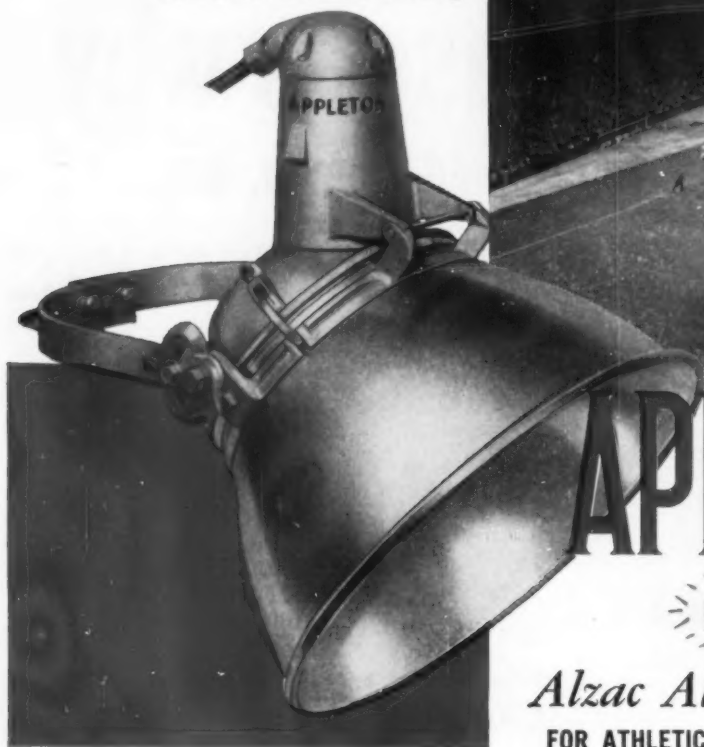
Write to address below for free catalog, U. S. Electrical Wires and Cables.



**UNITED STATES RUBBER COMPANY**  
ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

**"Permit me to congratulate  
you on the production of  
a fine light..."**

**Charles A. Comiskey**



# APPLETON

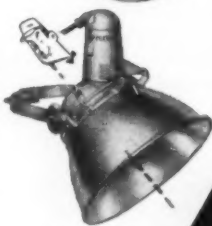
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TRADE MARK

*Alzac Aluminum Floodlights*  
**FOR ATHLETIC FIELDS and OTHER LARGE AREAS**

**Split-Second Rear Re-lamping—** No tools needed! No nuts or bolts! Rear lid with lamp opens wide for easy access! Do it in seconds even during a game!



**Rifle Like Aiming—** After servicing, just flip lid down and clamp! Unit now weather sealed, perfectly! Exclusive louver ventilation eliminates condensation! Aim merely by looking through peep sight, then locking in position!



**New APPLETON Lights at Famed Comiskey Park in Chicago Turn Night into Day!** 768 *Intenso* floodlights mounted on eight towers give daylight visibility to the entire field. No wonder Charles A. Comiskey says "...the new White Sox lighting is unequalled anywhere in the Major Leagues..."

In addition, APPLETON *INTENSO* Floodlights offer greater ease of servicing, cleaning, relamping and positioning for maximum trouble-free year 'round lighting. That's why we say, investigate APPLETON *INTENSO* Floodlights before you buy!

*Sold Exclusively Through Selected Wholesalers*

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**Rely on APPLETON ... The Standard for Better Lighting**



Explosion-Proof Fixtures



Malleable Iron Union Fittings

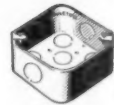
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Automatic Reels



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# ELECTRICAL CONSTRUCTION AND MAINTENANCE

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Electrifier and Electrical Record Established 1901

Published for electrical contractors, industrial electricians,  
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engineering, installation, repair, maintenance and manage-  
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September 1954

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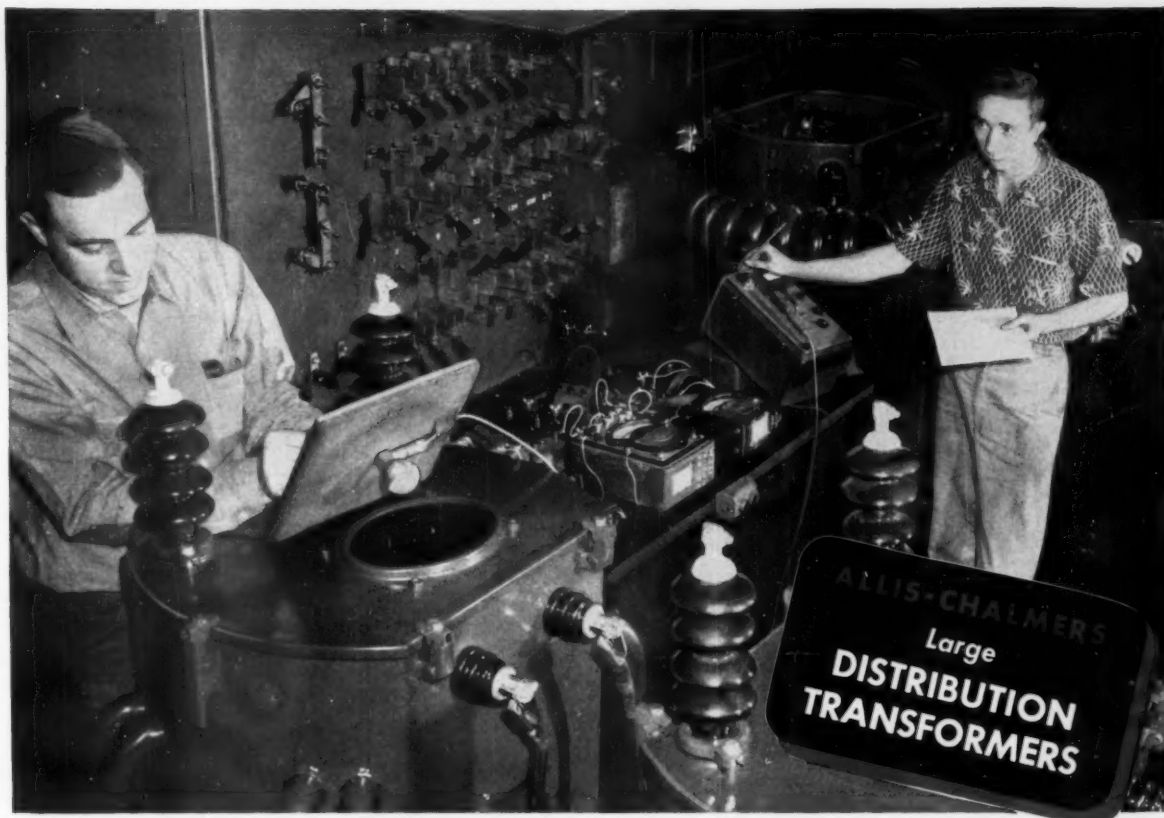
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# Sound Levels Checked

## by PRODUCTION LINE sound level testing

As distribution systems grow, distribution transformers in residential areas are getting larger. It's more important than ever to keep noise levels low.

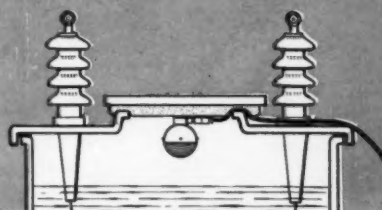
Since 1951, Allis-Chalmers has been conducting *production line* noise level checks on large distribution transformers. As a result, Allis-Chalmers has consistently delivered uniformly quiet transformers.

**Sound level research, too** — In cooperation with sound experts, Allis-Chalmers engineers are conducting research in magnetostriction in electrical core steels and resonance in core structures of all sizes and ratings. They are testing the effects of clamping pressures and anchoring of core and coil assemblies. Allis-Chalmers operates a separate, specially designed sound laboratory with extensive equipment for sound level research.

The result is a complete line of transformers that helps utilities build good will. If you would like more information on this or any other Allis-Chalmers transformer development, contact the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wis.

A-4366

### How It's Done



Here's how noise checks are made under normally noisy manufacturing conditions: The air space in the transformer tank above the oil becomes a miniature sound room. A microphone is suspended into this space and it is sealed from external noises. The microphone picks up noise when the transformer is energized. Noise level value is recorded and checked against established values.

# ALLIS-CHALMERS



*Explosion-Proof*

# CONDULETS\*



Crouse-Hinds Explosion-Proof Fluorescent Lighting Fixtures light the spray booths through glass panels at the top in this industrial painting department.



Type EYS Explosion-Proof Sealing Conduit



Type EVF Explosion-Proof Fluorescent Industrial Lighting Fixture



Type OFC Explosion-Proof Switch Conduit

**\*CONDULETS are made only by CROUSE-HINDS**

CONDULETS

TRAFFIC SIGNALS

# give you protection

## on electrical machines used in explosive atmospheres

On every electrical installation that you make in hazardous areas, explosion-proof (or dust-tight) equipment is a "must" . . . the National Electrical Code requires it and your own peace of mind demands it. The only question is just which areas are hazardous? The answer to that one is that any location is hazardous where combustible gases, vapors, or dusts are likely to be present in dangerous concentrations.

Lighting and power circuits and electrically driven machinery that operates in such areas must be explosion-proof (or dust-tight in dusty locations).

In many industries the hazardous locations are obvious but in others there are hazardous areas that are sometimes overlooked. For example, every painting department, large or small, introduces a hazard, because of the extensive use of combustible solvents in modern paints, enamels and lacquers.

In the painting department shown at the left, explosion-proof Condulets are used throughout . . . for maximum protection to the plant and to the workers.

In Crouse-Hinds Condulet Catalog there are listings of thousands of explosion-proof junction Condulets, plugs and receptacles, switches circuit breakers, lighting fixtures, and other electrical equipment suitable for use in hazardous areas or for mounting on machines for use in such areas . . . and additional thousands for use in non-hazardous locations.

All Condulets are built to Crouse-Hinds high standard of quality, from the finest materials, by highly skilled workmen. Use Condulets on every job and get the best. Whatever your problem, Crouse-Hinds engineers will gladly make specific recommendations.

Where quality counts . . . you can count on CONDULETS.

### CROUSE-HINDS COMPANY Syracuse 1, N. Y.

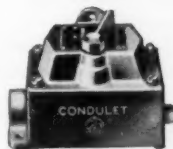
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Type EPC Explosion-Proof  
Motor Starter And Circuit Breaker  
Condulet



Type EFHC Explosion-Proof  
Fixture Hanger Condulet



Type EFS Explosion-Proof  
Tumbler Switch Condulet



Type GUAN Explosion-Proof  
Junction Condulet



Type EVA Explosion-Proof  
Lighting Fixture



Type EFSC Explosion-Proof  
Push Button Station Condulet



Type EYS Explosion-Proof  
Sealing Condulet



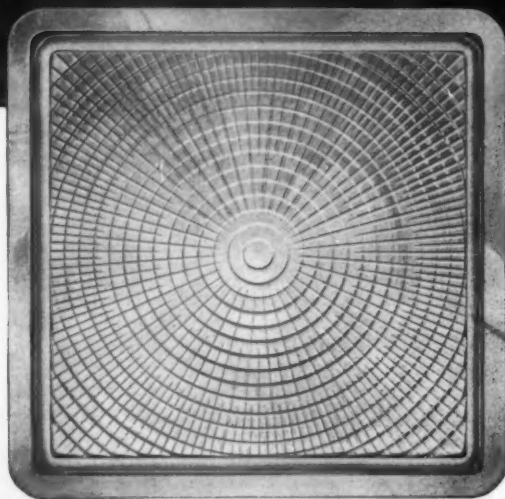
Type ECGF Explosion-Proof  
Flexible Lighting Fixture  
Support



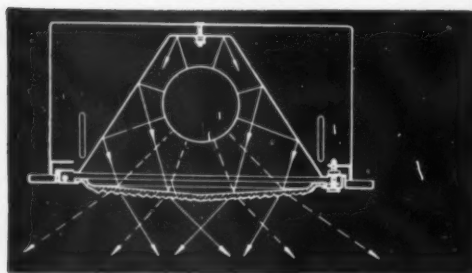
FLOODLIGHTS

AIRPORT LIGHTING

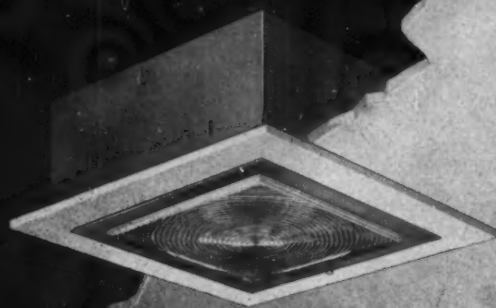
# ART METAL advanced ELIPTISQUARE



**advanced  
ELIPTISQUARE**  
Multiplies Light Output

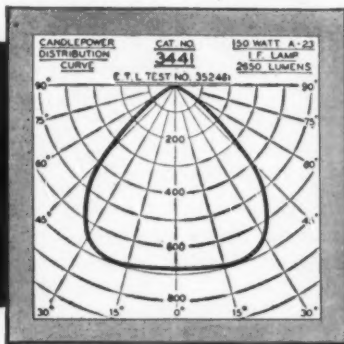


Eliptisquare reflector redirects *all* box-enclosed light downward through AMCOLENS to multiply lamp light utilization.



## with clear, prismatic AMCOLENS

- Lighted objects reflect their true color value
- Highest light transmission efficiency
- Precise light direction control
- Edge light to ceiling for visual comfort
- Shallow recessed lens lighting



Please notice that the candlepower distribution curve is by Electrical Testing Laboratories, Inc., not The ART METAL Company.

May we send Bulletin 254 which gives complete details? Please write:

**THE ART METAL COMPANY**  
CLEVELAND 3, OHIO

**Manufacturers of Engineered Incandescent Lighting**



For extra service quality...

# DUTCH BRAND plastic ELECTRICAL TAPES



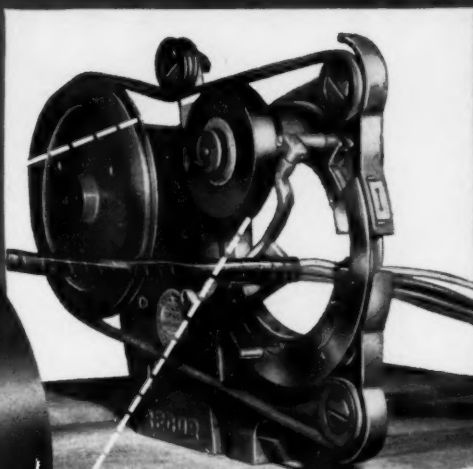
Taping Electrical Motor Leads



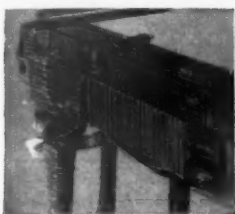
Taping Battery Leads



For Safer and Neater Insulated Wire Splices Use Dutch Brand Tape



Dutch Brand Tape Tapes Electrical Tapes... perfect for taping machines



Dutch Brand... Perfect for Taping Electrical Bus Bars



Taping Tool Handles Provides Better Grip and Protection



Neat Splicing for Limited Space

## The complete line... that meets every industrial need

.007" is the standard electrician's favorite for general use. .010" for heavy duty work and for use with power driven taping machines. .020" . . . unexcelled for extra heavy duty work, and resistance to abrasion. Color: **DUTCH BRAND Vinyl COLOR TAPE** in 8 colors and four widths, perfect for color coding, indexing, and electrical insulation. Use the complete DUTCH BRAND line!

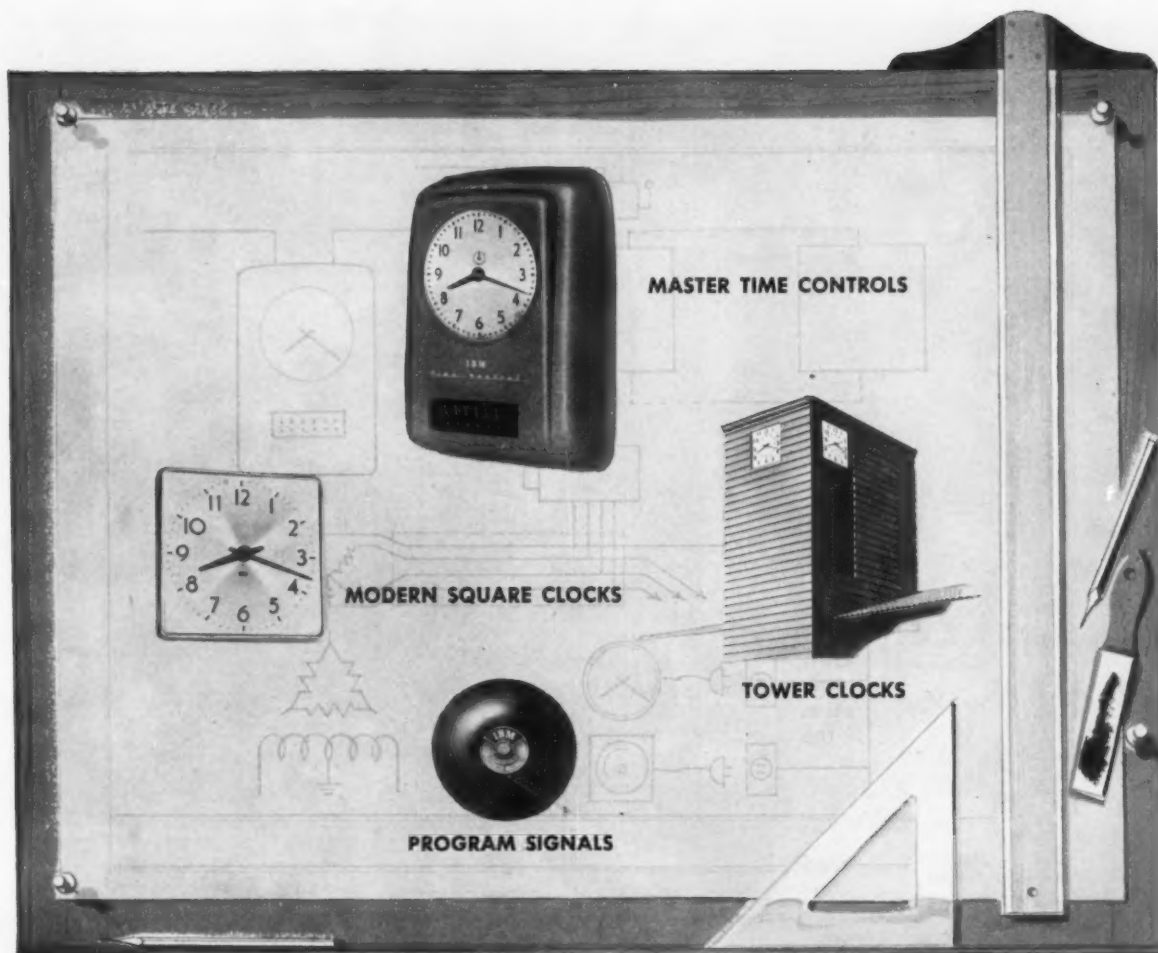
### PROPERTIES AND CHARACTERISTICS

	.007	.010	.020	COLOR
DIELECTRIC STRENGTH	1000 V/MIL	1000 V/MIL	900 V/MIL	1000 V/MIL
TENSILE STRENGTH	20 LBS./INCH OF WIDTH	30 LBS./INCH OF WIDTH	40 LBS./INCH OF WIDTH	15 LBS./INCH OF WIDTH
ADHESION TO POLISHED SURFACE	30 OZ./INCH OF WIDTH	30 OZ./INCH OF WIDTH	20-30 OZ./INCH OF WIDTH	28 OZ./INCH OF WIDTH
ELECTROLYTIC CORROSION	1.0 MIN.	1.0 MIN.	1.0 MIN.	1.0 MIN.
RESISTANCE TO OIL & GREASE	GOOD	GOOD	GOOD	GOOD
ABRASION RESISTANCE	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
RESISTANCE TO ACIDS & ALKALIS	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT



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- **Easy, economical to install** . . . clocks and signals connect with regular AC lighting lines . . . are supervised electronically.

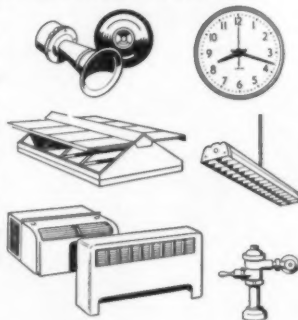
- **Self-regulating on 12-hour basis** . . . master control automatically checks—and corrects as much as 12 hours, if necessary—all clocks twice daily. Automatic self-regulation assures coordination of all time units.

- **Can be altered with little cost or effort** . . . system may be expanded, units relocated, without expense of additional controls or special wiring.

### Control Utilities Automatically

IBM Electronic Time and Program Signaling Systems can save costs, conserve natural resources by automatically scheduling utility functions . . .

sound audible signals • open and close ventilators • turn heating and air conditioning systems on and off • switch light circuits on and off • open and close water flow valves.



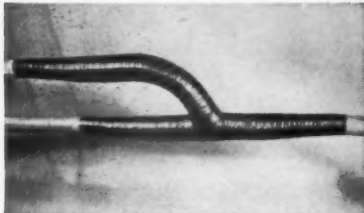
You're **RIGHT ON TIME** . . . with

**IBM** *Time* **EQUIPMENT**

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## UNUSUAL BRANCH CONNECTOR Saves Manhole Wall Space

With all the remarkable synthetic fibers appearing on the market, a lot of new plants are going up to manufacture them. One of the biggest plants ordered 28,000 feet of Okolite-Okoprene cable for its underground primary distribution system.



One of the interesting features of this big installation was their method of saving manhole wall space—an important consideration in all underground work. Since the cable was about 2" in diameter, it would have required around 24" space for training the tap, if a regular Tee joint was used.

Instead Okonite engineers worked out a preformed branch connector, in cooperation with a fitting manufacturer. From the picture you can see that by forming the connector instead of bending the cable the radius of bend was cut in half. Q.E.D.: only half as much manhole wall space was required.

Engineers at this plant weren't taking any chances with their cables...and they weren't taking any chances with their splices either. They made all their splices with Okolite, Manson and Okoprene tape.

It's good sense and good business to use a better tape and obtain a joint that's "spliced for life." The tape represents only a small fraction of the total cost of the job.

Why not send for a set of instruction sheets, EC-5678; you'll find them helpful.



...when you splice with:



AVAILABLE  
THROUGH  
AUTHORIZED  
DISTRIBUTORS ONLY

1441

Made by  
**THE OKONITE COMPANY**

PASSAIC



NEW JERSEY



SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS



**Owner:** Rockingham Hospital, Bellows Falls, Vermont  
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**Electrical Engineer:** Edwin P. Mahard, Boston, Mass.  
**Electrical Distributor:** New England Electrical Supply Co., Boston, Mass.

**General Contractor:** The MacMillin Company, Inc., Keene, New Hampshire

**Architects and Engineers:** James H. Ritchie and Associates, Boston, Mass.



Bending is easy with the Republic Calibrated Bender. No need to measure the tube with a ruler. All you do is use the "Inch-Marks," line them up with the marks on the bender. Bends are smooth, without wrinkles.

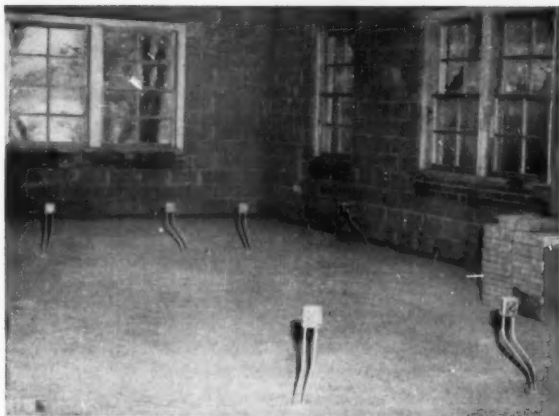




# On Hospital Jobs... Among Many Others

## REPUBLIC "INCH-MARKED" <sup>ELECTRICAL METALLIC TUBING</sup>

### Gives You Double Benefits



After the pour, stubs can be easily adjusted to meet partition lines because Republic E.M.T. is ductile. For runs in the slab, additional savings are possible because standard octagon box with connectors already installed makes it easy to attach runs.



Republic E.M.T. was used in Rockingham Hospital. This popular "light wall" electrical conduit comes with the exclusive "Inch-Marking" in the 1/2", 3/4" and 1" sizes.

**FIRST:** You get the opportunity to finish the job on schedule. Republic E.M.T. goes in so easily there's no wasted effort.

Ductile, Republic E.M.T. is easy to bend, accurately. Your electricians line up the "Inch-Marks" on the tubing with the built-in reference marks on the Republic Calibrated Bender. The result is bends-on-the-button made right on the spot.

Wire-pulling is easier because Republic E.M.T. has an exclusive inside-knurling that helps wires to slide through.

**SECOND:** You're sure that the electrical raceway you're installing is dependable. And that's important on jobs like hospitals, schools and other institutions. With Republic E.M.T., you're using conduit that's approved by the National Electrical Code for exposed, concealed and concrete slab construction. Inspected by Underwriters' Laboratories, and meets A.S.A. Specification C80.3.

On your next job, ask your distributor for Republic, the quality E.M.T. The only E.M.T. that carries the famous "Inch-Marking" that means quality tube that's easy to install. If your distributor doesn't carry it, write to:

#### REPUBLIC STEEL CORPORATION

*Steel and Tubes Division*

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for the best in Time Switch Performance:

## ...use Sangamo Heavy Duty Time Switches



Unfailing on-off control... that's what you get when you specify Sangamo Heavy Duty Time Switches. No detail has been overlooked to offer you a time switch which represents the utmost in accuracy, sturdiness and dependability.

Sangamo Heavy Duty Time Switches are available for almost any conceivable application from the simplest on-off operation—to complex multi-operation schedules.

1. **Slow Speed Motor.** Powered by the famous Sangamo 450 r. p. m. hysteresis motor. Quiet, requires no oiling and never needs repairs. Keeps operating under wide temperature variations.
2. **Long Service Life** is assured by solid silver contacts of "minimum-arc" design and bronze bearings at points of greatest wear.
3. **Available with Automatic Carryover and Astronomic Dial.** Automatic carryover assures continued operation for up to 10 hours in event of power failure. Astronomic dial controls switching schedule in accordance with sunrise and sunset... and compensates daily for the progressive changes in seasons.

### Have you tried the Low Priced Type B?

Here's a time switch with high Sangamo *quality* at a new, low price... a switch you can install and forget... a switch that will go on working without constant attention. It has the same low-speed, hysteresis motor with the same maintenance-free features as the heavy duty model.



The Sangamo Type B wipes out the service headache. When you install it, you're spared the wasted expense of call-backs due to motor failure, jammed levers, burned contacts or stuck dials. Sturdy, attractive, all-steel case with hinged cover and sealable hasp... anyone can operate it... installs easily—case is designed so there's wiring room in almost half the inside space...  $\frac{1}{2}$ " to  $\frac{3}{4}$ " multiple knockouts... NEMA Standard 30 ampere rating... single pole, single throw construction... long life solid silver contacts and bronze bearings at points of greatest wear.

\* Your electrical wholesaler can furnish all types of dependable Sangamo Time Switches. See them before you specify time control for your next installation. Insist on Sangamo—for the best in time switch performance.



**SANGAMO ELECTRIC COMPANY**

SPRINGFIELD, ILLINOIS



*Four Steps That Mean  
Easier, Quicker, Safer Installation of*

# CRESCENT A B C ARMORED CABLE



1 FILE OR SAW  
GUIDED BY CUTMARK



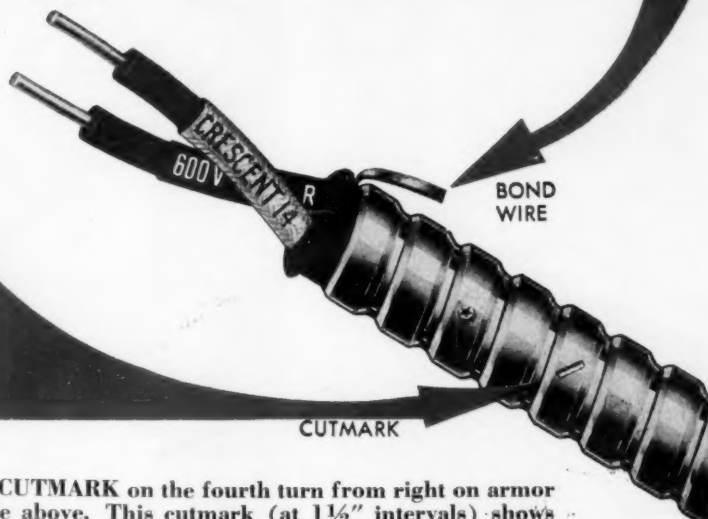
2 BREAK ARMOR



3 PULL OUT PAPER



4 INSERT INSULATING  
BUSHING



**NOTE CUTMARK** on the fourth turn from right on armor of cable above. This cutmark (at  $1\frac{1}{2}$ " intervals) shows the location of a prefabricated breaking line inside the armor. Only a few strokes of a file or saw guided by the cutmark, are required to cut through one outer ridge, and a bend by hand severs the armor. This results in a clean separation with no sharp edge—a safer, easier and faster job. The prefabricated breaking lines are so designed that there is no reduction in tensile strength, bending quality, crushing resistance and electrical conductivity of armor.

**NOTE BOND WIRE UNDER ARMOR** which is in contact with the under side of each convolution. This provides permanently low armor resistance. It is furnished in sizes No. 14 and 12 AWG Cable.

**GENUINE ABC CONSTRUCTION** provides for easy insertion of the insulating bushing because the paper under the armor readily *unwraps from under both ends* providing space to insert the bushing.

**ALL GLASS BRAIDS** protect the rubber insulated conductors, and are flame, moisture and rot proof. The use of ALL GLASS braid results in a cable with smaller diameter and lighter weight, being easier to handle and install.



## CRESCENT WIRE & CABLE

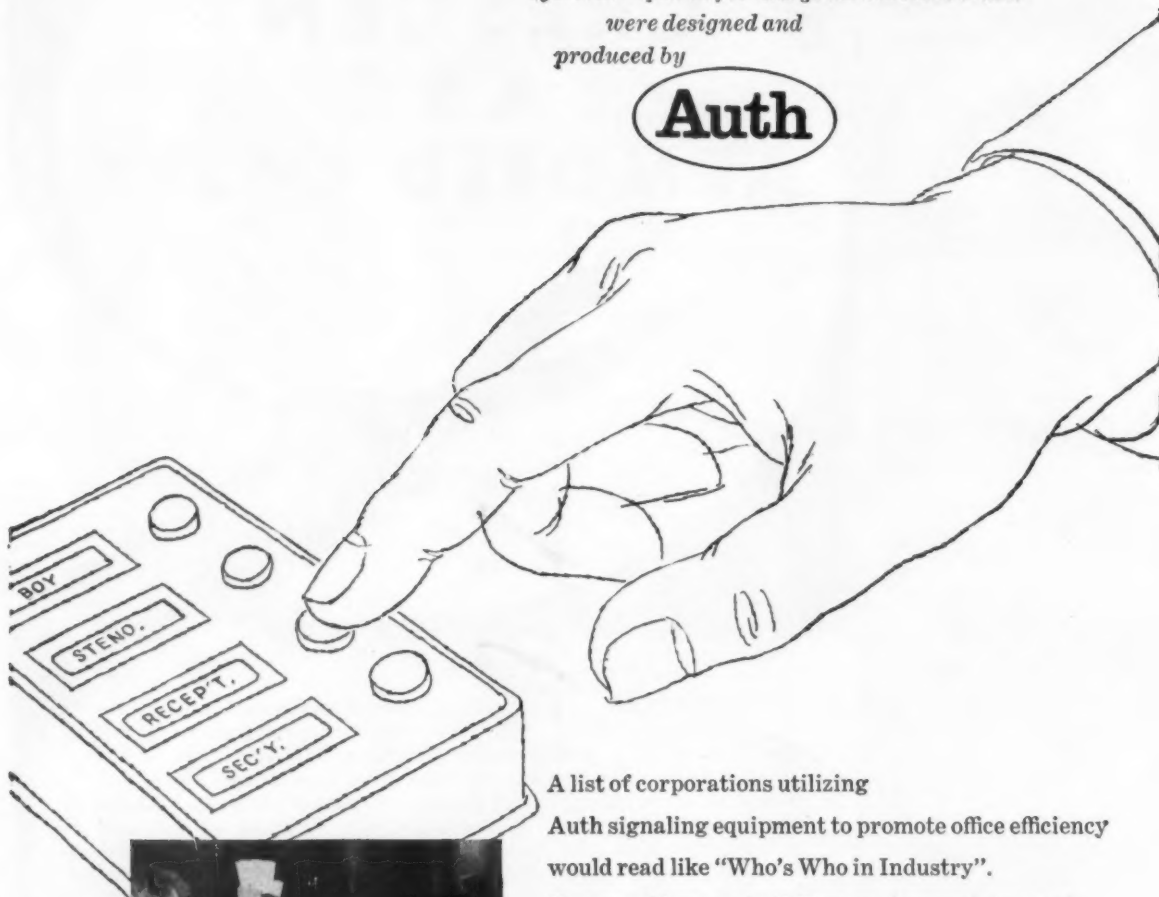


### CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.

...and for the offices of  
**LEVER HOUSE, NEW YORK**  
 the signal, protection and communication  
 systems required for this great business center  
 were designed and  
 produced by

**Auth**



A list of corporations utilizing  
 Auth signaling equipment to promote office efficiency  
 would read like "Who's Who in Industry".  
 For over 62 years Auth Buzzer, Annunciator, and  
 Inter-Communicating Telephone Systems have provided  
 simple and inexpensive means of inter-office  
 communication suitable for any size office.  
 For information write to *Auth Electric Company, Inc.,*  
*Long Island City 1, New York.*

SIGNALING, TIME AND  
 COMMUNICATION SYSTEMS  
 FOR HOSPITALS, SCHOOLS,  
 HOUSING, INDUSTRY AND SHIPS

**Auth**  
EST. 1912



# New Cutler-Hammer 9101 Switch joins a distinguished family of Small Motor Control Champions

TWO-POLE SWITCH FULLY  
DISCONNECTS MOTOR AND  
EQUIPMENT FROM POWER  
•  
FAMOUS C-H EUTECTIC  
OVERLOAD PROTECTION.  
FLIP TO "OFF" RESETS  
•  
SWITCH MECHANISM FITS  
IN ORDINARY HANDY BOX  
FOR FLUSH WALL MOUNTING



**CUTLER-HAMMER**  
MOTOR CONTROL  
CH

## CUTLER-HAMMER MOTOR CONTROL



**ELECTRICAL INSTALLERS** of the many devices for home, store or factory using motors up to 1 HP praise easy wiring of the new Cutler-Hammer 9101.



**MACHINERY BUILDERS** have been quick to adopt the new Cutler-Hammer 9101 for standard original equipment . . . better protection plus speedier installation.



**AUTHORIZED DISTRIBUTORS** everywhere proudly feature the new Cutler-Hammer 9101 Motor Switch . . . offer two-pole and single-pole models from stock.



**CUTLER-HAMMER 9115 MANUAL STARTER**—For dependable across-the-line starting and eutectic overload protection of single phase and polyphase motors up to 2 HP.



**CUTLER-HAMMER 9586 AUTOMATIC STARTER**—C-H 9586 Size 0 Automatic Starter permits economical and safe remote pushbutton control of motors up to 2 HP.

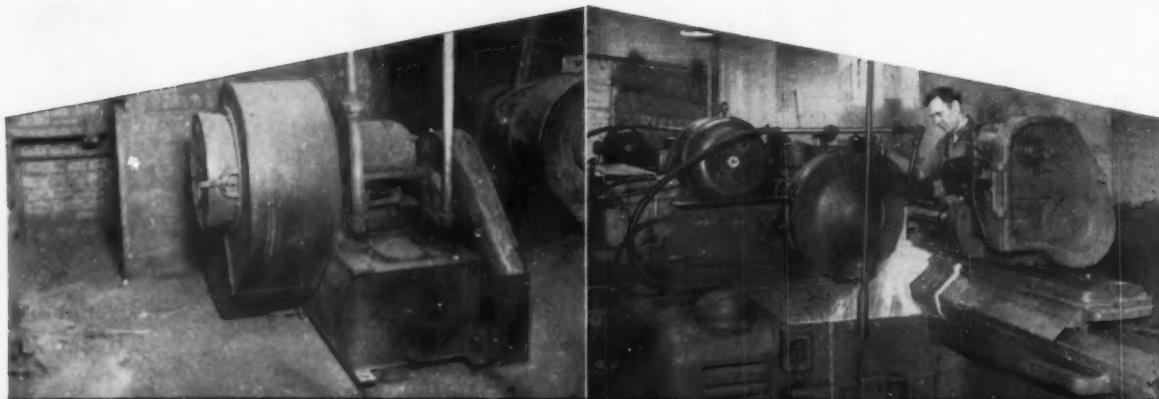


**CUTLER-HAMMER 9441 DRUM SWITCH**—Choice of the men who want the best in a switch for reversing or special control of machines in the home workshop.



**CUTLER-HAMMER 10017 PRESSURE SWITCH**—Both manufacturers and installers of pumps and water supply units say this widely used pressure control switch is the finest.

Copyright 1954, Cutler-Hammer, Inc., Milwaukee 1, Wis.



Century 3 h. p. motor driving a stone

Century totally enclosed fan cooled motor driving a grinder

## To Cut Down on Your Call-Backs...

Leading Manufacturers Choose

# Quiet, dependable *Century* MOTORS for Heating and Ventilating Equipment

One way to save time and avoid complaints is to make sure the equipment you install has proper motor-power to operate quietly and efficiently.

To assure this customer-pleasing performance, many manufacturers equip their products with Century motors. The wide range of Century motor types and sizes allows them to select motors that are *exactly right* for every job . . . motors that bring out the best in their equipment.

For long-lasting customer satisfaction . . . specify

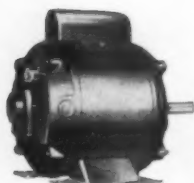


When you see Century motors operating equipment it's a sign that the motor-power is engineered as carefully as the product itself.

### CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities



Capacitor, Single Phase Motors  
1/8 to 1/2 h. p.



Split Phase, Single Phase Motors  
1/8 to 1/2 h. p.



Open, Drip Proof, General Purpose Motors  
1/2 to 1 h. p.



Splash Proof, Polyphase Motors  
1/2 to 1 h. p.



Repulsion Start, Induction Single Phase Motors  
1/2 to 1 h. p.

CE-809

**GET LOWEST INSTALLED COSTS... EVERY TIME... WITH**

# GEDNEY CONDUIT BODIES

**MALLEABLE IRON—HOT DIP GALVANIZED**

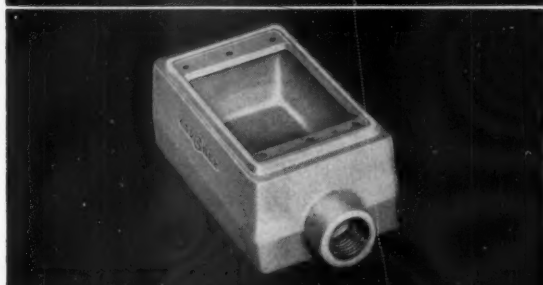
YOU CAN'T HELP but cut installation costs with Gedney Conduit Bodies. Every one of them is accurately machined and threaded...smooth finished...made of unbreakable malleable iron

...inspected for complete perfection. On top of that, they're special hot dip galvanized to assure absolutely top life on the job...and they come in all types and sizes from  $\frac{1}{2}$ " to 4".

## AMONG GEDNEY'S COMPLETE LINE ARE:



**TYPE LB—Threaded**—for heavy wall rigid conduit. Used with Gedney entrance fittings, straps, clamp backs, etc., you get an *entire* conduit system with hot dip galvanized finish.



**TYPE FS—Threaded**—shallow bodies for heavy wall rigid conduit. Only Gedney gives you hot dip galvanized as standard finish...no corrosive deposits on threads to slow down work and hike costs.



**NO MATTER WHAT** your requirements may be, there's always the right Gedney body and fitting for the job. To cut installation time and costs and assure long-run dependability, specify Gedney, always.



**GEDNEY FITTINGS FIT**

**GEDNEY**  
ELECTRIC COMPANY



RKO BLDG. • RADIO CITY • NEW YORK 20  
Foundry, Factory and Shipping Point: Terryville, Conn.

*Don't buy just "Type RR" High Voltage Cable*

# Phelps Dodge Habirite



▶ Experimental compound of high voltage, butyl rubber insulating material is carefully milled in Phelps Dodge's extensive research laboratory.



▶ Habirite butyl rubber insulation is shown being exposed to severe ozone conditions in one of Phelps Dodge's exacting laboratory tests.



▶ Habirite-Habirprene cable being checked for corona level, an important step in assuring safe operation of finished product.



▶ X-Ray machine used to carefully examine quality of cable insulation, also detects defects, porosity and foreign matter, helps eliminate faulty cable.



....Specify the finest!



# - Habirprene

**Rely on this highest quality cable—  
it works where others fail**

The term "RR" is just a name, not an assurance of quality. When you order high voltage RR cable, insist on Phelps Dodge Habirite-Habirprene—developed through years of experience in designing and making high voltage cables. Habirite-Habirprene exceeds the trade's highest standards of quality and reliability.

**Phelps Dodge Habirite** insulation, a specially engineered butyl rubber compound, has a service dependability record unapproached by any other type of rubber insulation. Habirite is greatly superior to old-fashioned insulations for these reasons:

- ▶ Much greater resistance to heat and oxidation. This permits a higher temperature rating, with consequent reduction in conductor size and in cable cost.
- ▶ Much greater resistance to ozone—present around high voltage equipment.
- ▶ Much greater mechanical toughness affording maxi-

mum protection against damage from tools, stones and other installation hazards.

- ▶ Better electrical properties—giving a greater safety factor in operation.
- ▶ Maximum uniformity of finished product—due to controllable uniformity of raw materials.
- ▶ Elimination of laminations which cause weak spots—through use of Phelps Dodge extrusion insulating process.

**Phelps Dodge Habirprene** sheath, a unique neoprene compound, is especially made to be extra resistant to corona, one of the worst enemies of high voltage cable. This *extra resistance to corona* is an exclusive Phelps Dodge feature. It provides a greater safety factor in operation and has contributed to the remarkable reputation and service record of Habirite-Habirprene.

When you specify Habirite-Habirprene, you are assured of getting RR cable with the utmost in safety and durability. Habirite-Habirprene is the result of Phelps Dodge's rigid quality standards, long experience, expert engineering and vast facilities.

## ***PHELPS DODGE COPPER PRODUCTS*** **CORPORATION**

**SALES OFFICES:** ATLANTA, 903 Candler Bldg.; BOSTON, 20 Providence Street; BUFFALO, 180 Perry Street; CHARLOTTE, 213 West First Street; CHICAGO, 100 West Monroe Street; CINCINNATI, 18 East Fourth Street; CLEVELAND, 816 Superior Avenue, N.E.; DALLAS, 3113 McKinney Avenue; JACKSONVILLE, 33 S. Hogan St.; DETROIT, 28 West Adams Avenue; FORT WAYNE, 4400 New Haven Avenue; GREENSBORO, N. C., P. O. Box 2643; HOUSTON, 3517-19 Polk Avenue; KANSAS CITY, MO., 406 West 34th Street; LOS ANGELES, 6100 Garfield Avenue; MILWAUKEE, 2408 N. Farwell Avenue; MINNEAPOLIS, 5009A Excelsior Blvd.; NEW ORLEANS, 1009 Carondelet Bldg.; NEW YORK, 40 Wall Street; PHILADELPHIA, 1617 Pennsylvania Blvd.; PITTSBURGH, 1532 Oliver Bldg.; PORTLAND, ORE., 1220 S.W. Stark St.; RICHMOND, 113 E. Cary St.; ROANOKE, 3645 Martinel Avenue; Castle Heights, S.W.; ST. LOUIS, 1221 Locust Street; SAN FRANCISCO, 369 Pine Street; SEATTLE, 505 Skinner Bldg.; WASHINGTON, D. C., 14th and "F" Sts., N.W.



**Holdtite® Friction Tape** is the tops for general use. Has a high-strength fabric that makes it superior and dependable tape. High dielectric strength and strong adhesion. Straight-tearing, non-ravelling, contains no pin holes. Exceeds A.S.T.M. specifications.



**Holdtite Rubber Tape** is unbeatable for perfect splicing when used with U.S. Holdtite Friction Tape. Exceeds A.S.T.M. specifications.



**Royalastic Plastic Tape** is highly resistant to water, oils, acids, alkalis and corrosive chemicals. It does the work of both rubber and friction tape for a wide range of jobs. High dielectric strength. High tensile strength. Clings tightly. Good stretch. Makes neat splices.



## Handy guide to the right U. S. tape for any splicing job



**U. S. Gray Perfection Friction Tape** has the strongest type of adhesion with a firm tack. A stronger, heavier, high tensile strength fabric. No pinholes. Will not dry out. Meets and exceeds all accepted specifications. Recommended for the most exacting jobs.



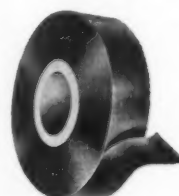
**Usco Splicing Compound.** The new (not reclaim) finest grade natural rubber used in USCO insures perfect and waterproof splices. It gives longer life—greater mechanical strength—better insulation. Will fuse into a solid mass quickly without heat.



**Uskorona Splicing Compound** gives 100% protection on high-voltage jobs. Maximum resistance to both ozone and moisture. Ideal for underground use. High tensile strength, elongation, extremely high dielectric strength, low power factor. Fuses quickly without heat or pressure, makes perfect splices.



**United States Rubber Company** is a single source for every electrical tape. Simplify your purchasing by using *one line*. See your distributor or contact any one of our 27 District Sales Offices.



**UNITED STATES RUBBER COMPANY**  
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

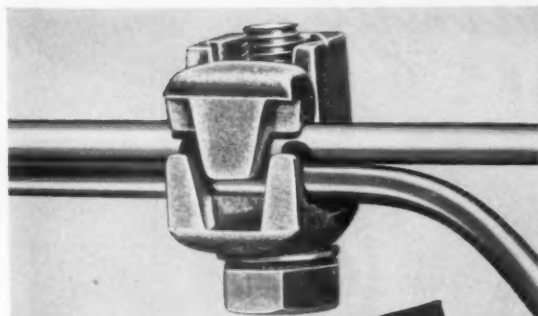
# EXTRA! EXTRA! EXTRA!

## ANDERSON

HIGH-STRENGTH BRONZE ALLOY

### Dura GRIP

#### CONNECTORS



DG-6



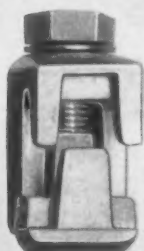
DG-8



DG-4



**ABW DESIGN**  
MEANS QUALITY  
*Plus* STRENGTH in  
the RIGHT PLACES



DG-2



DG-1



DG-1/0



DG-2/0



DG-4/0



Anderson Dura GRIP Connectors will withstand Mercurous Nitrate Specifications ASTM B-154-51 and the more severe ABW 124-2 which insures against seasonal cracking and stress corrosion failures.

FOR MORE COMPLETE INFORMATION, consult your nearest ABW representative or contact our home office.

*Aluminum & Bronze* POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES  
for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS for over a Quarter Century



## ANDERSON BRASS WORKS, Inc.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

# B-M *Fittings*

**ARE APPROVED AS  
CONCRETE TIGHT**



When setting E. M. T. in concrete you can make each job easier and more profitable by using Briegel All Steel Indenter Fittings that have UL approval as CONCRETE-TIGHT. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E. M. T. connectors and couplings.



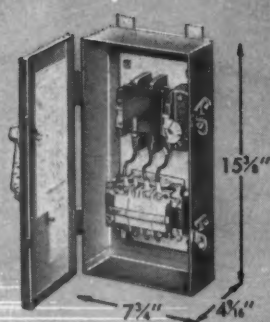
All B-M Indenter Fittings are U. L. approved as Concrete-tight and for General Use. (File Card E 10863). Also comply with Federal Specifications W-F-406.



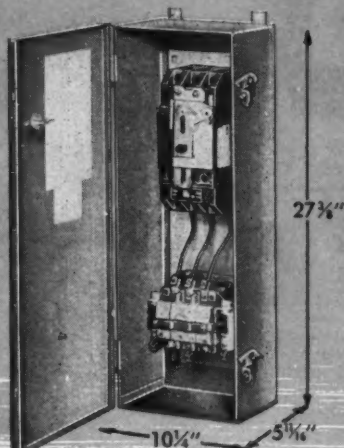
**BRIEGEL** **METHOD  
TOOL  
CO.**  
GALVA, • ILLINOIS

*Warehouse Stocks in Principal Cities for Immediate Delivery!*

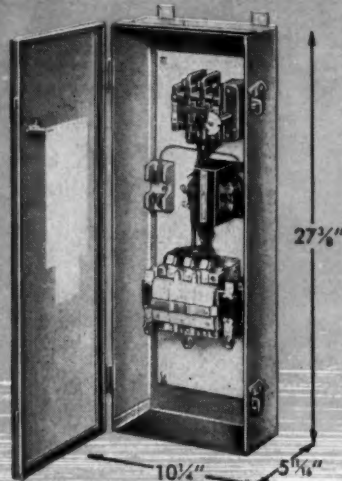




NEMA 1, Size 1  
Unfused Combination



NEMA 1, Size 2  
Circuit Breaker Combination



NEMA XII, Size 2  
Unfused Combination

## New PERFORMANCE STANDARDS

for new machines or old with

# ARROW-HART



## TYPE "RAC"

## COMBINATION STARTERS

### ENCLOSURES:

- GENERAL PURPOSE (NEMA TYPE I)
- INDUSTRIAL USE (NEMA TYPE XII)
- . . . built to JIC STANDARDS
- Also for Textile and Other Industrial Applications

### AVAILABLE:

- WITH DISCONNECT . . . Fused or Unfused
- WITH CIRCUIT BREAKER TYPE DISCONNECT
- IN ACROSS-THE-LINE, REVERSING and TWO-SPEED TYPES
- IN NEMA SIZES 0, 1, and 2
- WITH AND WITHOUT CONTROL CIRCUIT TRANSFORMER, LOCAL CONTROL, AND OTHER MODIFICATIONS

Combining radically smaller size and lighter weight with the advantages of advanced safety and dependability, these revolutionary Arrow-Hart Type "RAC" Combination Starters outwork . . . outlast . . . out-mate every other type. An all-new, front-operated disconnect—a new line of enclosures in NEMA Types I and XII — and the exclusive A-H "Right Angle" Starter set new standards for maintenance ease, superior performance, and control versatility.

YES! Arrow-Hart Type "RAC" Combination Starters will help all machines—old and new—realize their full productive efficiency. Extreme dependability helps eliminate costly down-time . . . smaller size, easily accessible contacts, and extra room in the enclosure provide the ultimate in installation and maintenance ease . . . Straight-Thru wiring improves safety standards.

You owe it to yourself to write for complete information — NOW!

MAIL THIS  
COUPON  
TODAY

SINCE



1890

Quality

## ARROW • HART

INDUSTRIAL CONTROL DIVISION

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MOTOR CONTROLS • WIRING DEVICES  
ENCLOSED SWITCHES • APPLIANCE SWITCHES

INDUSTRIAL CONTROL DIVISION  
THE ARROW-HART & HEGEMAN ELECTRIC CO.  
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- ☐ Please send literature describing the Type "RAC" Combination Starter.  
☐ Please send catalog covering the complete AH-Motor Control Line.

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POSITION \_\_\_\_\_  
COMPANY \_\_\_\_\_  
COMPANY ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

ECM

## guaranteed footage ... plus

You get full measure with every roll  
of Jenkins Gold Seal Tape.

But what's even more important,  
every inch measures up to the Gold Seal  
standard, which makes every roll go further.  
It has lasting "tack" in any weather.

A few neat wraps and the job's  
finished . . . one thickness insulates. Get the  
most "coverage" per roll . . . specify Gold Seal.

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### JENKINS GOLD SEAL TAPE FOR EVERY JOB



Available in 10-roll cartons or  
single rolls. Every roll cellophane  
protected to stay factory-fresh.



### JENKINS

*Gold Seal Tape*

Jenkins Bros. also make  
Diamond Seal Friction and Rubber Tapes  
which meet ASTM Specifications.

A PRODUCT OF JENKINS BROS. . . .

MAKERS OF FAMOUS JENKINS VALVES

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1954

## This Electrical Contractor Practices What He Preaches

*President's Office, Hydon-Brand Company, Detroit. Wakefield Theta-Plex modular ceiling with Rigid-Arch plastic diffusers and acoustical baffles. Factory-wired channels with ballasts and lamp sockets are mounted on the structural ceiling (painted white) above the plastic diffusers. Fluorescent lamps go in perpendicular to the channel. If desired, conditioned air may be diffused into the room from the plenum through the multitudes of tiny openings in the baffles. If desired sprinkler heads may be installed at the intersections of baffles.*



## Installs "Electric Ceilings" In His New Building So He Can Prove Their Value To His Prospects

*Hydon-Brand Company, Electrical Contractors and Engineers of Detroit, Celebrate Diamond Jubilee of Light by Using and Selling Wakefield Multi-Function "Electric Ceilings", thus Getting Larger Share of the Building Dollar.*

Take for instance the Wakefield Theta-Plex installation in the president's office, as shown in the photograph. Here we see an "electrical ceiling" providing three basic elements—high level illumination, acoustical baffles and air diffusion.

Other areas of this modern new building are equipped with Wakefield Beta-Plex units. In every instance this wide-awake contractor is out to demonstrate to his prospects that such highly functional ceilings will do more for less money in the over-all picture than conventional

hanging fixtures. He aims to cut himself a bigger piece of the building pie.

There is no time like Jubilee Year time to set up to do this kind of large scale, profitable business. If you aren't already geared up to sell Wakefield integrated multi-functional ceilings you are missing the biggest opportunity for getting a larger share of the building dollar the electrical contractor has ever had.

*For complete information and descriptive literature, write The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.*

## Wakefield Over-ALL Lighting



WAKEFIELD GEOMETRICS



THE CAVALIER



THE GRENADIER



THE PACEMAKER



THE COMMODORE

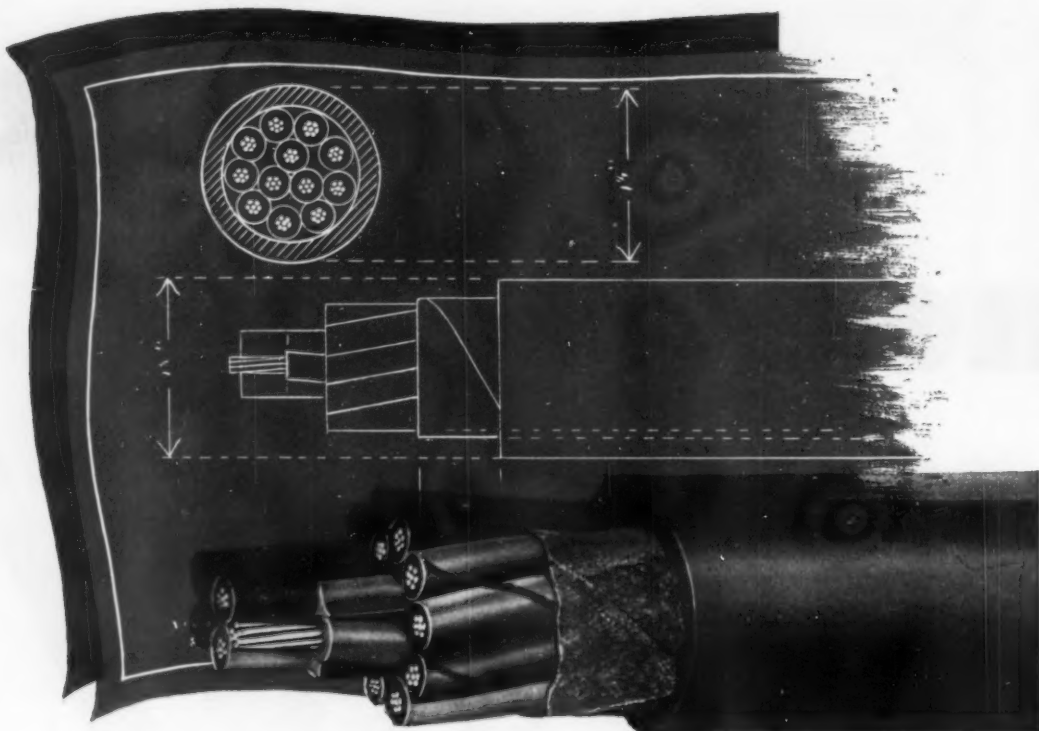


THE STAR



THE WAKEFIELD CEILING





**WATERTITE-HAZAPRENE CONTROL CABLE**

## DESIGN DOESN'T COST... IT PAYS

Good design is just about all that matters in control cables. If you start with good design it will pay off in dependability, long service life and economy.

Watertite-Hazaprene control cables are designed with the following features:

**SHEATH:** Tire-tough Hazaprene ZBF: neoprene compounded to Hazard's exclusive formula. Offers superior resistance to flame, oil, acid, moisture, sunlight and mechanical damage. Pressure-vulcanized in a continuous metal mold for a smooth, dense surface that resists abrasion and tearing.

**INSULATION:** Long-lived Watertite, a firm, elec-

trically stable, rubber insulation that resists moisture and heat, prevents deformation.

**FILLERS:** Rubber, to prevent the wicking-in of moisture and to add firmness to the construction.

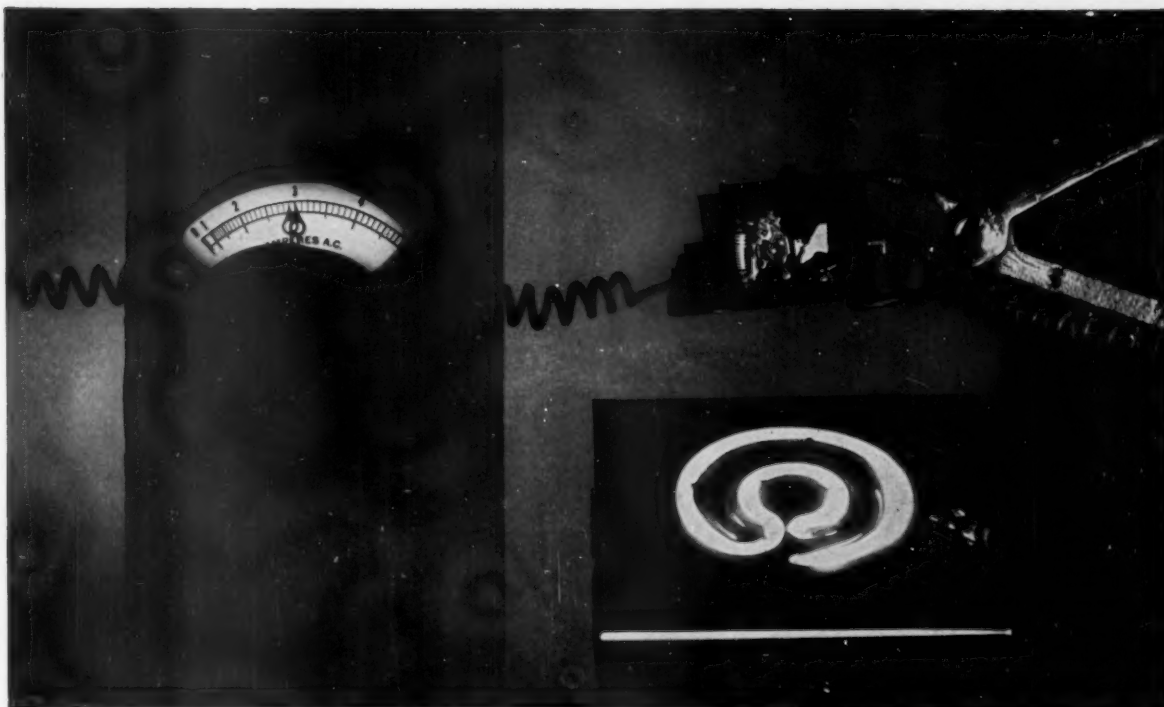
**CONDUCTORS:** Strong and flexible; tin coated to resist corrosion.

There's a Watertite-Hazaprene cable for every control circuit requirement. See your Hazard representative or write for complete information. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.



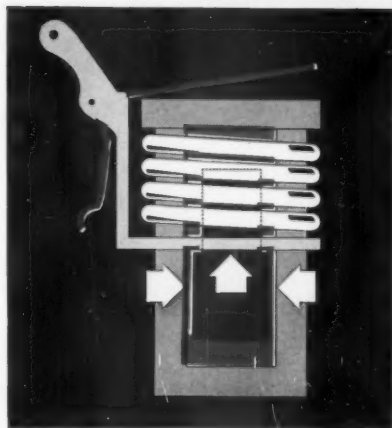
**HAZARD**  **insulated cables**





Laboratory demonstration shows 30 amperes continuously flowing through 30 ampere Heinemann Circuit Breaker held over hot plate.

## the one circuit breaker principle ... THAT IGNORES **HEAT!**



### The FULLY MAGNETIC Principle

One magnetic coil is the entire actuation of HEINEMANN Circuit Breakers. Thermal warp elements are eliminated. On short circuits, the coil instantly trips the breaker. On small overloads, a time delay is introduced while the movable core is drawn toward the pole piece, increasing the magnetic flux. Moreover, the time delay is proportioned to the overload ... being shorter for large overloads ... and longer for small ones.



HEINEMANN Circuit Breakers .. One, two and three pole .. 10 milliamps to 100 amperes

HEAT ... the downfall of most circuit protection equipment ... will not alter the performance of Heinemann Circuit Breakers. You can locate Heinemann Circuit Breakers in hot kitchens, boiler rooms, or near steam pipes without fear of false tripping. With Heinemann, current is the only consideration ... and current (not heat) trips the breaker. There is no need for de-rating ... never nuisance tripping, yet Heinemann provides the fastest circuit interruption available for short circuits and proportioned response for overloads.

Performance and dependability to this extent explains why better contractors are using Heinemann Circuit Breakers on their jobs.

Send for complete literature. HEINEMANN ELECTRIC COMPANY, 132 Plum Street, Trenton 2, N.J.

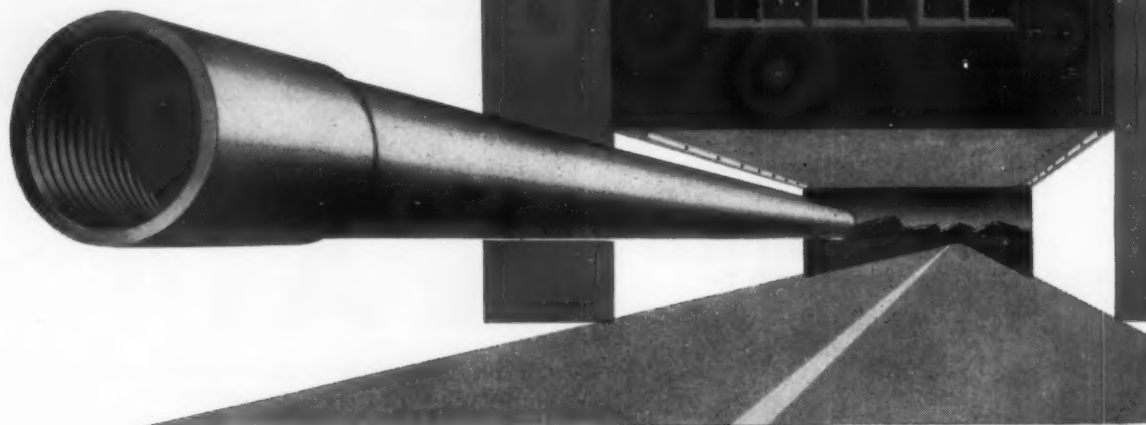
## don't use heat... **USE POWER**



# SPANG<sup>®</sup>

## CONDUIT

helps assure safe driving on the West Virginia Turnpike



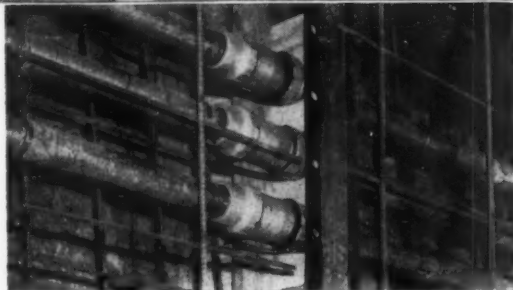
When you're driving along a highway and suddenly enter a long tunnel, it is vitally important to your safety that the tunnel is properly lighted. To assure years of safety through dependable lighting, it is equally vital that the tunnel's wiring receives top protection.

The wiring in the ½-mile Memorial Tunnel on the new West Virginia Turnpike is protected by the best in conduit . . . *top-quality* Spang Conduit.

11,000 ft of 1½" Spang Conduit have gone into the ceiling slab for 426 regular and emergency tunnel lighting outlets. 8,080 ft of 3½" *top-quality* Spang are being used in one tunnel wall for high tension feeders.

Spang Conduit is easier to cut, thread, bend and weld, because the manufacture of Spang is *quality-controlled* throughout. Each length is tested and inspected before shipment.

When you're buying conduit and you want extra quality at no extra cost, be sure to specify Spang. Write for complete information and the name of your nearest Spang Distributor.



Owner:	West Virginia Turnpike Commission
General Contractor:	Bates and Rogers Construction Co., Chicago, Ill.
Electrical Subcontractor:	Barnes and Brass Electric Co., Clarksburg, W. Va.
Designing Engineers:	Singstad & Baile, New York, N.Y.
Supervisory Engineers:	Howard, Needles, Tammen and Bergendoff, New York, N.Y.
Spang Distributor:	Westinghouse Electric Supply Co., Clarksburg, W. Va.



### SPANG-CHALFANT

Division of The National Supply Company  
 GENERAL SALES OFFICE:  
 TWO GATEWAY CENTER, PITTSBURGH, PA.  
 District Offices and Sales Representatives  
 in Principal Cities



## Chicago Contractor says... **"Sure I use G-E Ballasts—My Customers Are Important to Me!"**

Mr. Henry F. Ullrich is purchasing agent of a successful lighting contractor firm in Chicago, Illinois—the Kelso-Burnett Electric Co. When asked about G-E ballasts, he had this to say:

"I use fixtures that are equipped with G-E fluorescent ballasts because I know from experience that they're not going to cause trouble. I'd say that they can be counted on to give extra years of service.

"Lately I've noticed an increase in the number of calls for replacement ballasts. Whenever I get one of these, I make certain I use a G-E ballast. Then I know I'll have a satisfied customer. Sure I use G-E ballasts. Why shouldn't I! My customers are important to me!"

Years of design leadership and expert manufacturing techniques account for the popularity of G-E ballasts with men who know the lighting business—men like Mr. Ullrich.

On your next job, be sure to specify General Electric ballasts. Your lighting equipment distributor should have them.

### **FREE CROSS-REFERENCE GUIDE**

Mr. Contractor, we have for you one of the most useful publications ever prepared on ballasts. It's a cross-reference chart which tells you at a glance the catalog numbers of similar ballasts produced by leading manufacturers. It will make it easy for you to use G-E Ballasts for replacement. Get your copy today—free of course! Mail this coupon.

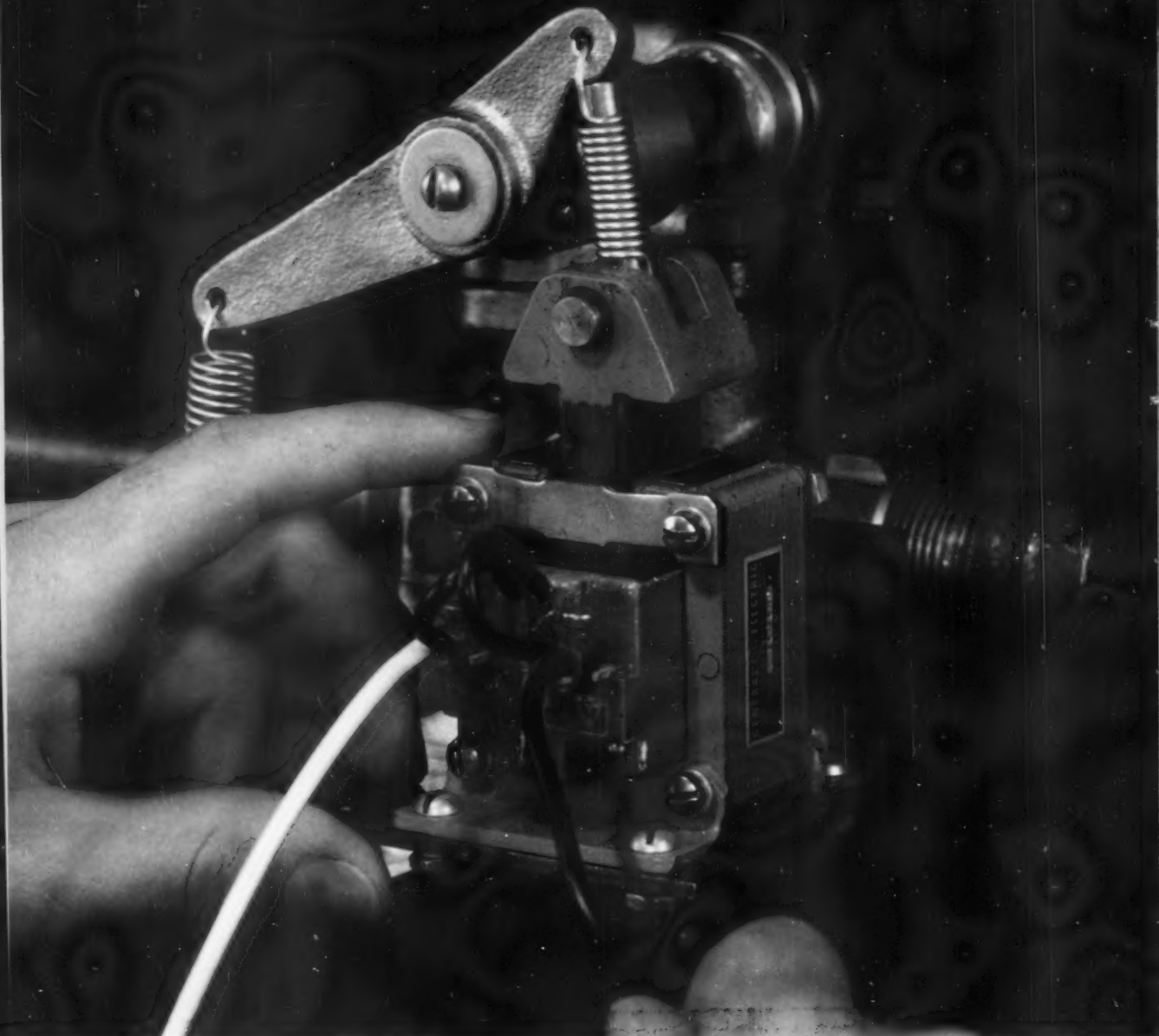
**GENERAL**  **ELECTRIC**

General Electric Co.,  
Section C401-11,  
Schenectady, N. Y.

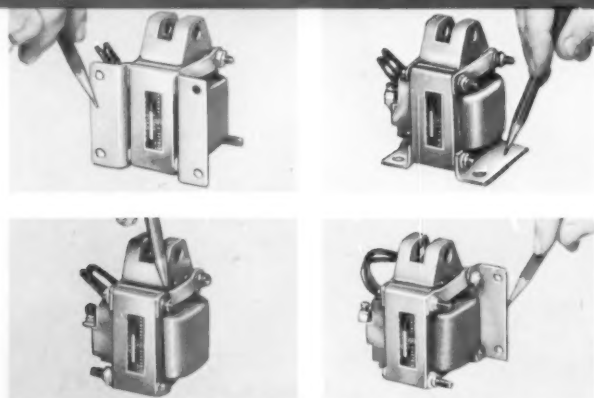
Send me a free copy  
of your cross-reference  
guide on Ballasts.



Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

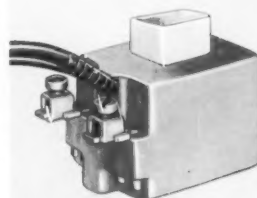
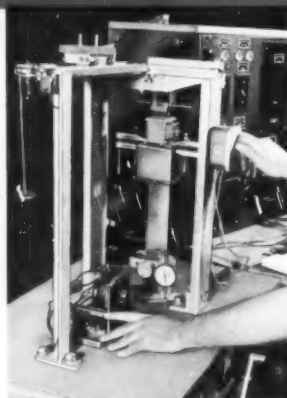


#### GREATER FLEXIBILITY



New General Electric solenoids mount in five positions — end, right- or left-side, throat, or with thru-bolts. Both leads and built-in terminal board on strongbox coils give added flexibility.

#### LONGER LIFE



Laboratory tests proved the new strongbox solenoid has much longer life. Long life results from design features such as strong-box coil, and double-strength, spring-steel mounting brackets.



# **NEW** **STRONGBOX SOLENOIDS**

The all-new line of General Electric industrial solenoids was designed to include the features you requested. From your requirements, design specifications for the new line were written — and here is the new, more economical solenoid you asked for.

## **GREATER FLEXIBILITY**

New solenoids mount in five positions. Mounting brackets can be moved to any of the four sides, or thru-bolts can be used. Both leads and built-in terminal board on strongbox coils make either type wiring immediately available.

## **LONGER LIFE**

New General Electric solenoids last longer because of new design components. Strongbox coils, enclosed layer wound Formex\* windings, give long electrical life. New double-strength, spring-steel mounting brackets contribute to added life. New design also includes glass fabric plunger guide, and larger linkage-pin hole.

## **COMPLETE RATING COVERAGE**

Complete coverage is supplied by nine ratings in each of the following forms (nominal ratings at maximum stroke).

- 3.0 to 40 lbs in  $\frac{1}{2}$  inch pull forms
- 1.4 to 36 lbs in 1 inch pull forms
- 2.0 to 33 lbs in  $\frac{1}{2}$  inch push forms
- 4.3 to 28 lbs in 1 inch push forms

Sizes are available in 60, 50 and 25 cycle, and d-c forms. Voltage ratings are from 24 to 600 volts.

## **SMALLER SIZE**

22 percent smaller for the same power ratings, new General Electric solenoids will reduce space problems when mounting solenoids in your equipment. Smaller enclosures and reduced material costs make new solenoids more economical.

FOR MORE INFORMATION contact your nearest Apparatus Sales Office, or Distributor, or write Section 730-58, General Electric Company, Schenectady 5, N. Y. Ask for Bulletin GEA-6215.

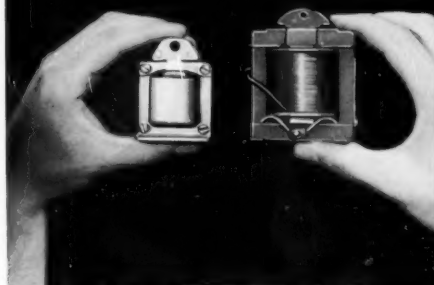
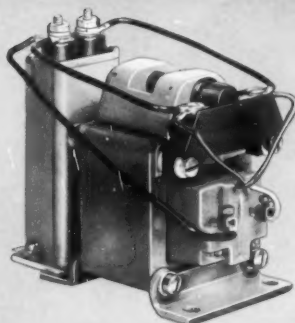
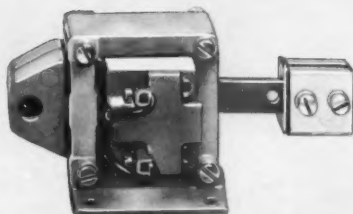
\*Reg. Trademark, General Electric Co.

*Progress Is Our Most Important Product*

**GENERAL**  **ELECTRIC**

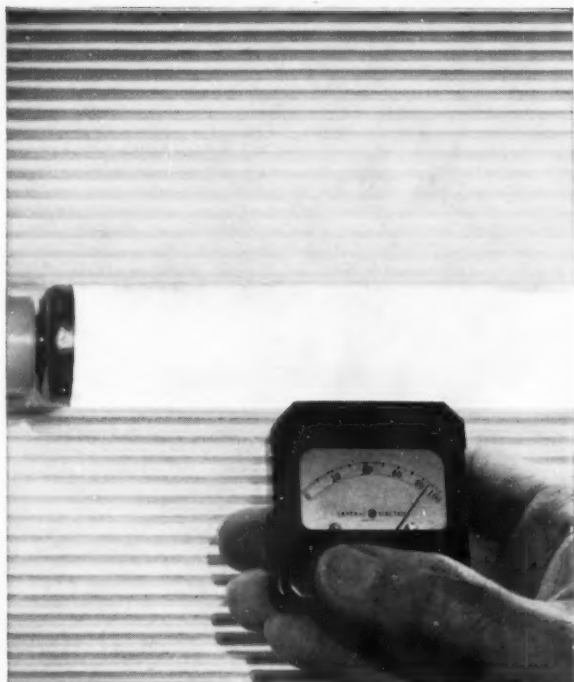
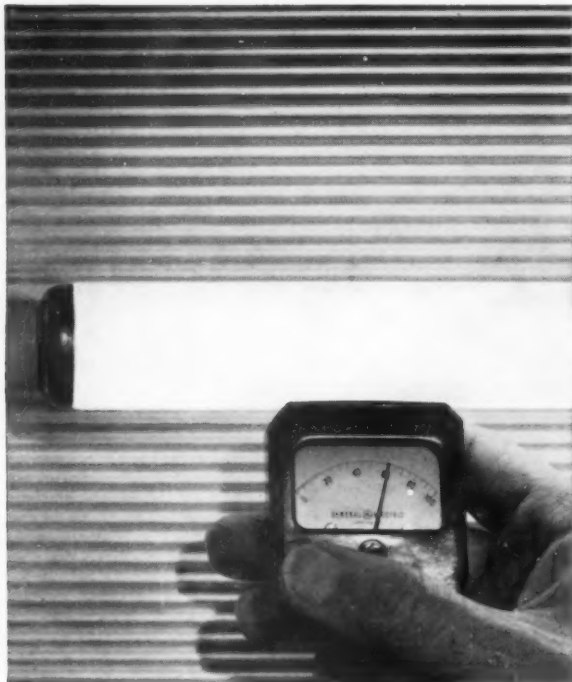
**COMPLETE RATING COVERAGE**

**SMALLER SIZE**



Supplied by nine force ratings in each of the forms, new strongbox solenoids are available in both push and pull forms, at one-half and one inch strokes. All these sizes are available in d-c, 25, 50, and 60 cycle a-c, with voltage ratings from 24 to 600 volts.

22% smaller for the same power ratings, new General Electric solenoids will reduce space problems in your equipment.



Regular slimline, left, gives 620 units of light. New High Output Rapid Start lamp, right, gives 840 units of light.

## NEW GENERAL ELECTRIC FLUORESCENT LAMP GIVES $\frac{1}{3}$ MORE LIGHT THAN ANY PREVIOUS FLUORESCENT

**LIGHTS ALMOST INSTANTLY**—General Electric announces the most important advance in fluorescent lighting in 10 years: the new High Output Rapid Start fluorescent lamp. The 96-inch High Output lamp gives 36% more light than the most powerful G-E fluorescent lamp previously available.

For new installations, General Electric High Output lamps offer this  $\frac{1}{3}$  bonus of light without increasing the number of fixtures or maintenance costs.

This big increase in light, with no increase in lamp size, has been achieved through a special cathode developed by General Electric which permits a boost in lamp wattage to 100. Because the cathode is of the famous General Electric triple coil design, these Rapid Start lamps light up almost instantly. General Electric High Output lamps have a rated

life of 7,500 hours, the same as all General Electric general lighting fluorescent lamps.

A new G-E base and socket design protects the lamp contacts by recessing them. A simple push-pull sets the lamp in its fixtures.

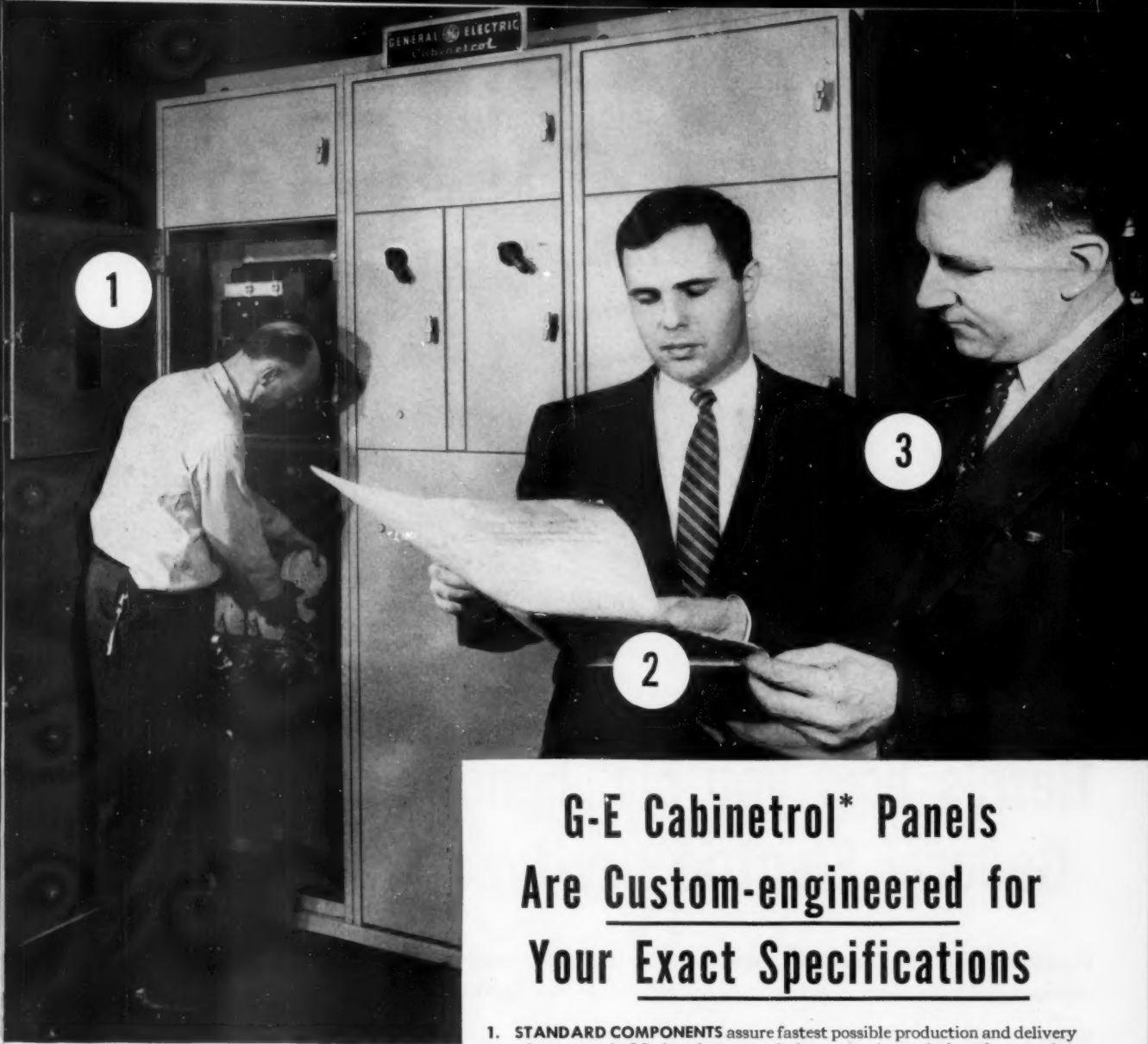
### HAS VARIETY OF USES

The new General Electric High Output fluorescent lamp is especially suited for use in areas with high ceilings, in factories, warehouses, offices and stores. Also in store windows, showcases and other places where you want higher lighting levels in keeping with the modern trend. New fixtures designed for the G-E High Output lamp will soon be available from a number of lighting fixture manufacturers.

For information, write to Lamp Division, General Electric Company, Dept. 166-EC-9, Nela Park, Cleveland 12, Ohio.

*Progress Is Our Most Important Product*

GENERAL  ELECTRIC



## G-E Cabinetrol\* Panels Are Custom-engineered for Your Exact Specifications

1. **STANDARD COMPONENTS** assure fastest possible production and delivery of your panels. Modern factory techniques speed completion of your order.
2. **YOUR REQUIREMENTS** are followed exactly. Thorough examination and testing assure "job-tailored" performance.
3. **EXPERIENCED G-E ENGINEERS**—working closely with you—design the unit to meet your application.

Cabinetrol panels are not costly, improvised modifications of some other type of control center. These panels form a **standard** low-voltage control system which handles all motor types up to 600 hp from a central location. You get the time-saving and money-saving advantages of standard components which are custom-assembled.

For complete information, contact your nearest G-E Apparatus Sales representative. Or write for the descriptive bulletin, GEA-3856, Section 780-4, General Electric Company, Schenectady 5, New York.

\*Reg. trade-mark of General Electric Co.

GENERAL  ELECTRIC



**MOUNTED AT THE LOAD**, G-E dry-types offer your customer savings on plant rewiring. They reduce the length of expensive

low-voltage feeders by providing the correct voltage at the load. Power dollars are stretched by reducing line losses.

## Here's how you can benefit by installing General Electric dry-type transformers

**Ample distributor stocks in most popular ratings mean you can get G-E transformers in the right rating, at the right time**

When it comes to a low cost solution to lighting, power and space problems, contractors are finding it pays to specify G-E dry-type transformers. And a complete selection of G-E dry-types is available at your local electrical distributor.

G.E. offers you a complete selection of highest quality dry-type transformers; Type M's, rated .25 to 15 kva for use indoors or out, and Type D's, rated 25 kva and up for use indoors only.

**CONVENIENT TO HANDLE**, G-E dry-types are easy to install. Applied at the load, they are easy to mount in out-of-the-way places. You save valuable time . . . and you save your customer valuable space.

**WHATEVER YOUR NEEDS**—whether you are stepping voltage up or down, boosting or bucking—you can get the *right* transformer by contacting your nearby G-E distributor. For more information, write for Bulletin GED-2024 describing G-E dry-type transformers and typical applications. Address General Electric Co., Section 411-122, Schenectady 5, N. Y.



**EASY TO HANDLE**, G-E dry-types like this Type M can be easily mounted on a column or wall.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**





# JOY MANUFACTURING COMPANY

**guarantees  
jumpers 2 years**  
*and makes them with*

**BRONCO**  
*Certified* **60**

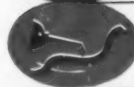
**REQUIREMENTS  
OF A  
DIESEL  
CONTROL  
JUMPER:**



*Maximum  
flex life*



*So flexible it  
can easily be tied  
in a knot*



*Outstanding  
oil resistance*



*Flameproof*



*Weather  
resistant*

These requirements are met so completely in Bronco 60 Certified that Joy Manufacturing Company can guarantee their Multi-Flex Diesel Jumpers for two years.

DIESEL CONTROL JUMPERS take one of the roughest beatings it is possible to give portable cable. Vibration and flexing are continuous. Temperature variation is extreme. Oil always present. Sunlight... Ozone... Every element which quickly destroys ordinary cable is abundantly present where these jumpers are at work. Yet Joy Manufacturing Company is able to guarantee their Multi-Flex Diesel Jumpers "to provide at least two years of satisfactory, trouble-free service." The 27 to 27 Pole Multi-Flex Jumper illustrated here is made with four lengths of seven-conductor Bronco 60 Certified cable. You can read the branding on the jackets. Note especially the phrase—60% Neoprene by weight. It is this full measure of Neoprene which gives Bronco 60 Certified its superior resistance. Superior toughness combined with superlative flexibility make this cable your first choice for rugged applications. Specify...and be sure you get... Bronco 60 Certified.

**BRONCO 60 CERTIFIED**, made with a protecting jacket certified to contain not less than 60% Neoprene by weight is manufactured by:



**WESTERN INSULATED WIRE CO., Los Angeles 58, California**

# NEW G-E MOTOR

## Saves up to



**Expands with your plant requirements . . .** Select only those standardized sections, control units and accessories which meet your present needs. Then, as your power consumption grows, you can easily expand to keep pace with your changing control requirements. Only minimum or "on-the-job" wiring is necessary.

**Compare the DA7093** with other leading competitive Control Centers. Feature for feature, dollar for dollar, you get more with G.E.'s space-saver.

**H**ERE'S a new product that spells savings all along the line . . . from initial purchase to on-the-job operation. G.E.'s all-new Motor Control Center (Type DA7093) puts your motor control capacity in approximately *half* the space formerly required. It takes nine NEMA size one or six NEMA size two control units in one standard 90-inch trough. This means fewer sections to buy, fewer sections to find space for and fewer sections to maintain — a clean-cut case of dollar-and-cents economy.

More than a space-saver, this new Control Center incorporates engineering advances which drastically cut installation time, step up capacity, simplify operation and slash maintenance costs.

Equally important, it embodies new safety features . . . *extra* features that provide *extra* safety to the contractor or plant engineer.

Look at these major engineering advances . . . which bring you unprecedented savings, dependability and safety:

**Center Busing** doubles vertical bus capacity (from 300 to 600 amperes) . . . leaves top and bottom pull boxes free for wiring within and between sections . . . allows continuous main bus of 600 or 1200 ampere capacity up through five sections.

MOTOR CONTROL CENTER FEATURES	General Electric DA7093	Mfg. A	Mfg. B	Mfg. C
Can accommodate 9 size 1 starter units with disconnect and transformer	Yes	No	No	No
Center Busing	Yes	No	No	No
Split Type "B" Terminal Blocks	Yes	No	No	No
Individual Stab Blocks	Yes	No	No	No
Individual bus insulators	Yes	No	No	No
Positive unit grounding	Yes	No	No	No
Straight-in wiring to main lugs accessible from front	Yes	No	No	No
No across hinge wiring	Yes	Yes	No	No
Edge to Edge Configuration Main bus	Yes	No	No	No
Minimum 4 1/2 x 6 inch wiring gutter	Yes	No	No	No
Unit Pull handle	Yes	Yes	No	No
Vertical Bus, minimum 5 inch spacing	Yes	No	No	No

# CONTROL CENTER

## 50% in Floor Space

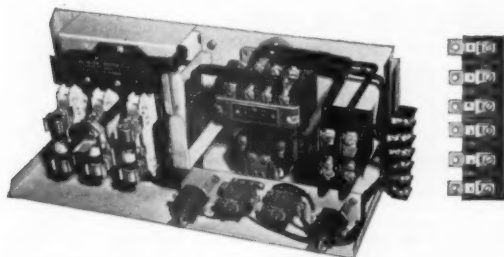
**Split Type "B" Terminal Blocks** allow you to add, switch or extract control units *without disturbing established wiring.*

**Individual stab mountings** cut your maintenance costs by as much as one-third because they can be replaced individually.

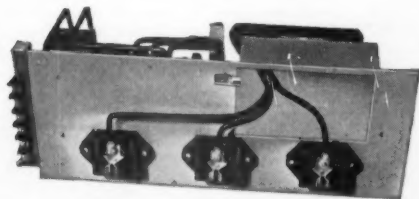
**Positive grounding of each control unit** *before* units engage bus bars. This, plus locking devices for both the control unit and operating handle, gives *added* protection.

Add a whole host of other design developments and you'll agree the DA7093 is designed for the future — *your* future.

For further details, please contact your nearest General Electric Apparatus Sales or Assemblies & Components Sales representative. Or write for Bulletin GEA-6160 — General Electric Co., Distribution Assemblies Department, Plainville, Connecticut.



Control unit showing neat arrangement for easy maintenance. Type "B" Terminal Blocks (shown right) permit unit to be removed without disturbing wiring. Notice the fusible disconnect that can accommodate either or both Type NEC or Type CLF current limiting fuses.

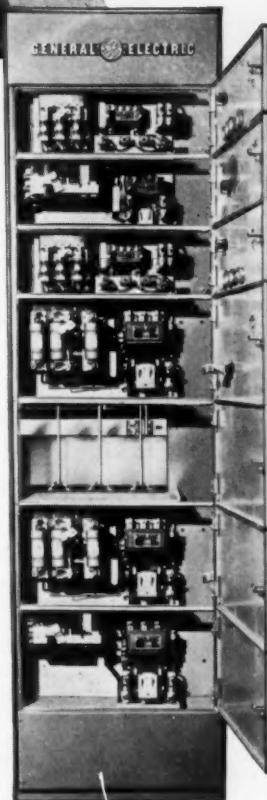


Rear view of Control unit showing three individual bus stabs of silver-plated pure copper. Re-inforced with heat-treated spring steel, they assure positive contact with vertical bus.



Let a G-E motor control specialist show you how to conserve your motor control floor space. Let him help you select equipment for your specific requirements.

1. Center busing ups bus capacity from 300 to 600 amps . . . leaves top and bottom pull boxes free for wiring within and between sections. Result: more ampere capacity per dollar; quicker, easier installation.
2. Large wiring gutters (4 $\frac{3}{4}$ " x 6"), plus wiring straps to keep wiring clear of units, simplify installation.
3. Removable cover plates for continuous center busing . . . hasten installation.
4. Doors that open past center so they won't hamper installation or maintenance work.
5. Disconnect handle takes three padlocks for *added* safety.
6. Pilot devices are mounted on control unit, thus eliminating across-the-hinge wiring . . . preclude frayed wiring with resulting short circuits.



*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

# This **FREE RLM BOOK** brings you valuable information on the Proper Specification of Industrial Lighting Equipment



*provides you with Specification Data covering*

## 4 ESSENTIALS to GOOD LIGHTING EQUIPMENT PERFORMANCE

*and the names of manufacturers from whom you can secure such equipment*

These are the 4 ESSENTIALS TO GOOD LIGHTING EQUIPMENT PERFORMANCE ASSURED BY THE RLM LABEL:

1. High Light Output—to assure you of MORE LIGHT FOR YOUR MONEY
2. Proper Shielding—to assure you of MAXIMUM PROTECTION FROM HARMFUL GLARE
3. Quality Construction—to assure you of MINIMUM MAINTENANCE COSTS
4. Uniform Quality from fixture to fixture—to assure you of UNIFORMLY SATISFACTORY RESULTS throughout the lighting system

● Everyone who buys, sells and specifies industrial lighting equipment should have a copy of this helpful 52-page reference work. It contains nationally-recognized standard specifications for 75 types and sizes of industrial lighting units. Each one of these specifications incorporates the first three of the four "Essentials to Good Performance" listed at the left.

The RLM Specifications Book also explains fully why the RLM Label on lighting units is a Warranty for Uniform High Quality. It points out why you can rely on RLM-Labeled units of the same manufacturer to maintain a certain quality level within

your lighting system. Knowing that you can depend on such uniform quality, saves time, money and labor, in terms of such factors as uniformity of illumination, minimum service interruptions, low operating and low maintenance costs.

Also included with this free book is a list of the manufacturers who make RLM-Labeled lighting units. Act now to get up-to-date on proper specification of lighting equipment that assures you of 4 Essentials of Good Lighting Equipment Performance! Send for your free copy of the RLM Specifications Book. RLM Standards Institute, Suite 819, 326 W. Madison St., Chicago 6, Ill.

R741



### RLM STANDARDS INSTITUTE

INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers



**Tops in Quality  
Competitive in Price.**



## why *New* DIEHL Type "D" Motors are your best motor buy...

**These desired characteristics are inherent in the  
NEW DIEHL TYPE "D" MOTORS**

**STATOR INSULATION** is doubled in dielectric strength and exceptionally resistant to moisture, oil, chemicals and abrasion.

**LEADS** are specially insulated, last longer. Occupy less space. Permanently numbered to save wiring time.

**BALL BEARINGS** are oversize to provide excess load capacity. Pre-lubricated for years of trouble-free service.

**INDESTRUCTIBLE ALUMINUM ROTORS.** Keyed to the shafts in most frame sizes to prevent looseness under unusual and severe load conditions.

These, and many other features, backed by 68 years of motor-building experience, make Diehl Motors your best motor buy. We will welcome an opportunity to provide detailed information on Diehl Motors to meet your specific requirements.

Former N.E.M.A. Standard frame sizes still available for interchange and replacement.



Cutaway view of  
new Diehl Type "D" Motor

Motors that require least maintenance, stay on the job longest and deliver peak performance under the most severe operating conditions assure *maximum value per dollar invested.*

**DIEHL MANUFACTURING COMPANY**  
Electrical Division of THE SINGER MANUFACTURING COMPANY  
Finders Plant, SOMERVILLE, N. J.

Please send me the following bulletins

- ☐ New Type "D" Motor Bulletin No. EC-3304
- ☐ Consolidated Catalog & Price List No. EC-3310

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

**OTHER INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES**

Rome FlexAll, single conductor, is manufactured in sizes 14 AWG through 4 AWG. Standard color is black, put up in 500' cartons. Underwriters approved as Type UF—600 volts.

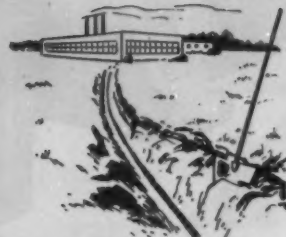
ROME CABLE CORP. 6AWG TYPE UF

5

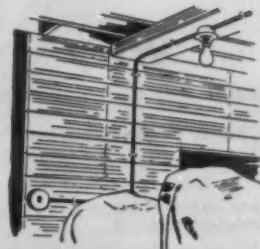
ways you can use new

**Do It Better—Do It Electrically**  
National Electrical Week, October 18-25

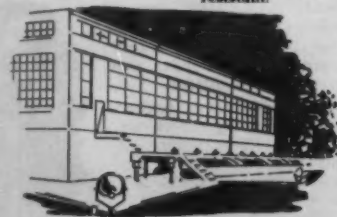
Two and three conductor Rome FlexAll is manufactured in sizes 14 AWG through 10 AWG. Standard color is pearl gray, put up in 250' cartons. Two conductor construction is available with or without ground wire. Underwriters approved as Type UF and Type NMC—600 volts.



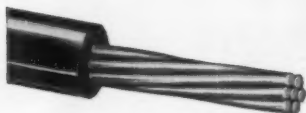
Buried direct in earth. Rome FlexAll is ideal for wiring between buildings.



Installed in livestock buildings or other locations destructive to conventional cables, Rome FlexAll is safe, non-rotting and flame resistant.



Rome FlexAll is ideally suited for the underground wiring of floodlight installations.



**Another Rome product that reduces inventory, saves money!**

You will find Rome FlexAll a high quality product, economically priced, and fully approved for multi-purpose use under the 1953 National Electrical Code. It reduces inventory, it is easy to handle, it is safe.

# Rome FlexAll to cut installation costs

DESIGNED for multi-purpose use, Rome FlexAll is economical, safe, neat appearing and has excellent resistance to the hazards of wet or corrosive locations. They are no longer wiring problems.

A new product of Rome engineering, Rome FlexAll is available with single, two and three conductors for branch circuit and feeder services. It is the answer to low cost industrial and commercial wiring, as well as the wiring of amusement areas, outlying farm buildings and residences.

Specifically, Rome FlexAll, single conductor, is approved by Underwriters' Laboratories, Inc., as Type UF (Underground Feeder), while the two and three conductor constructions are approved as, both, Type UF and Type NMC (Non-metallic Sheathed Cable—Corrosive Resistant). Such dual approval makes Rome FlexAll the inventory-saving choice for branch and feeder circuit work.

Rome FlexAll is recognized by the National Electrical Code for 1953 for the following types of installation:

**Single Conductor**

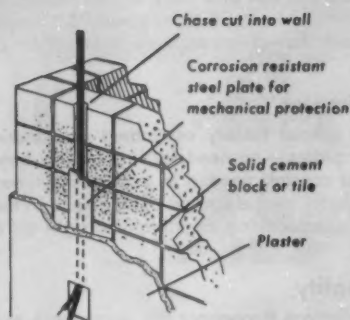
- For branch or feeder circuits buried directly in earth when provided with over-current protection.

**Multiple Conductor**

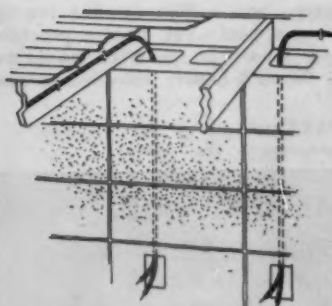
- For branch or feeder circuits buried directly in earth, as above.
- For interior wiring, either exposed or concealed in dry, wet or corrosive locations.
- For installation within hollow spaces of outside or inside masonry block or tile walls.
- For embedding in plaster or shallow chase in masonry, when suitably protected.

Rome FlexAll, single conductor, has an integrally applied all-resistant Rome Synthinol, Type TW, thermoplastic insulation and sheath. Rome FlexAll, two and three conductor, is insulated with the same high quality compound, with individual conductors covered with an inorganic glass yarn wrap. Over the assembled conductors is an abrasion, moisture, rot- and flame-resistant Rome Synthinol thermoplastic sheath.

If your wiring requirements involve direct burial in earth or the hazards of wet and corrosive conditions... ask for Rome FlexAll.



Embedded in plaster, Rome FlexAll makes for neater appearance in the rewiring of old buildings.

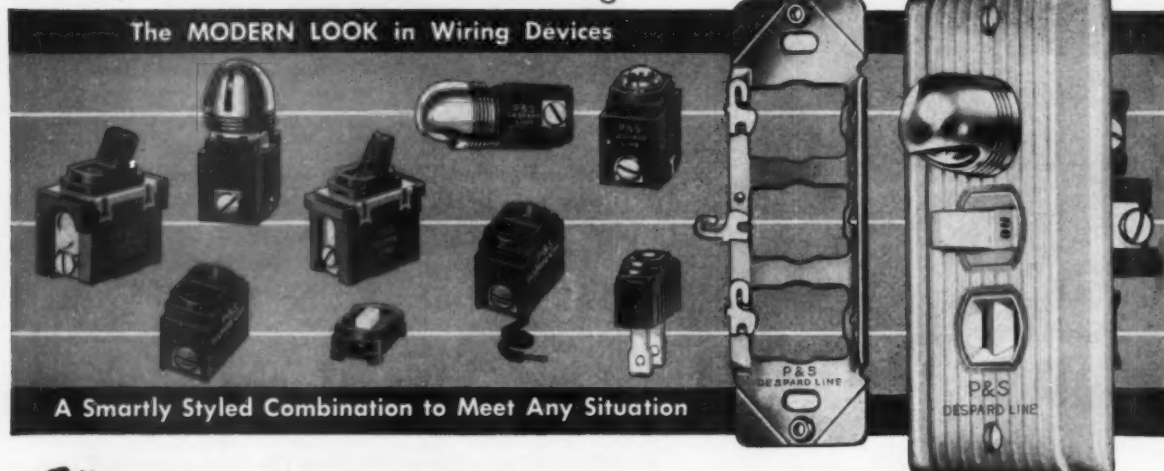


Rome FlexAll is easy to work within hollow spaces of masonry block or tile walls.



**It Costs Less to Buy the Best**

# P&S DESPARD LINE <sup>®</sup> The Original Interchangeable Line



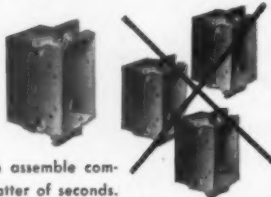
## Wire THE MODERN WAY

Two or three devices in the space ordinarily required for one . . . for a neater, better-looking job.



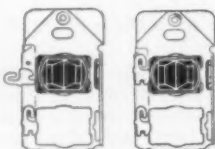
SAVE ON  
WALL  
PLATES

SAVE ON  
BOXES



... and, you can assemble combinations in a matter of seconds.

NO TOOLS  
NEEDED



Just insert the device and engage cam.

## Here's How P&S DESPARD Builds Business For You

### • Smaller Inventories—Smaller Investments

With a small stock of P&S Despard devices you are prepared to assemble practically any desired combination. You can give more service, faster, with a smaller inventory—and a smaller investment. Small, compact P&S Despard devices take up little room on your shelves—weigh much less than old-fashioned devices.

### • Makes Your Job Easier—Simpler

No need to stock (or wait for) special factory assembled combinations and clumsy, expensive multi-gang plates—no need for large bulky boxes. You can cope with the multitude of controls needed in modern institutional and commercial buildings—provide for real electrical convenience in modern homes—and assemble these good-looking combinations right on the job quickly and easily.

### • Builds a Reputation for Quality

Thousands of P&S Despard installations throughout the country are proof of the dependability of these precision-built devices. T-rated switches and double grip outlets meet Federal Specifications. You can be sure of a trouble-free installation, with no come-backs.

### • Gives You Merchandise You Can Sell

The P&S Despard Line looks different—and is different. The smartly styled, functional combinations have eye-appeal—yet, from a practical viewpoint, provide more convenience per dollar than any other line on the market. Build your business with P&S Despard beauty, convenience and dependability.

Use the coupon to get your copy of P&S Catalog 49.

*"In Canada—Renfrew Electric & Refrigerator Co., Ltd.—Renfrew"*

Pass & Seymour, Inc., Dept. M  
Syracuse 9, N. Y.

Give us all the dope on the P&S Despard Line.

Name

Firm

Street

City  Zone  State

We buy from

**PASS & SEYMOUR, INC.**  
**SOLVAY STATION · SYRACUSE 9, N. Y.**

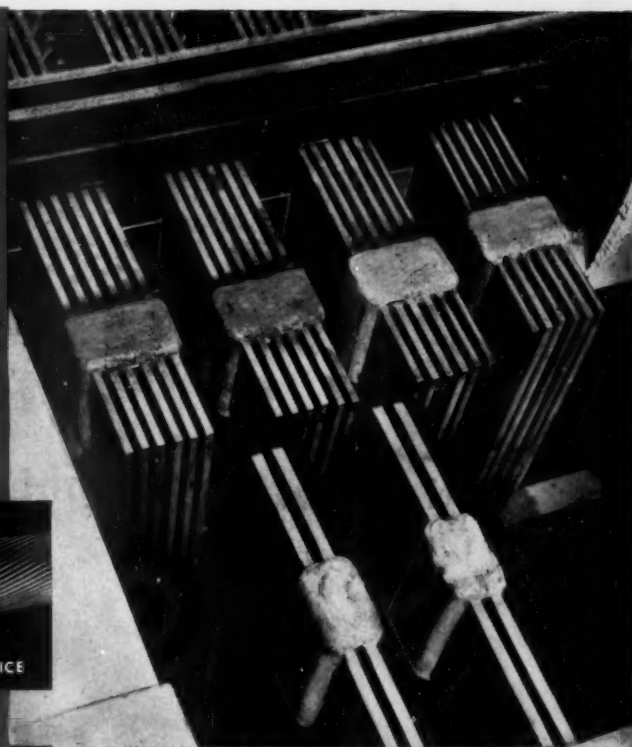
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Weatherproof Devices, Lampholders, Uniline Wall Plates.



Your  
ELECTRICAL  
SYSTEM  
is only as  
efficient as its  
**ELECTRICAL  
CONNECTIONS**



1/4 x 4" BUS CONNECTIONS

That is why design, construction and  
maintenance engineers specify

**CADWELD®**

.... the fusion weld that:

- cannot loosen or corrode.
- is 100% electrically efficient.
- has small O. D. for easy insulating.
- requires no inspection.

For the best in ELECTRICAL CONNECTIONS

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☐ Send Descriptive Literature on CADWELD Electrical Connections

☐ Have Representative Call

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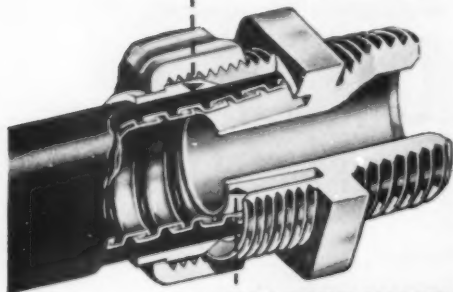
# NOW

## ...keep wiring really liquid-tight with NEW T&B Connectors for liquid-tight flexible metal conduit



### PLASTIC GRIPPING RING

- Seamless, pliable, oilproof plastic forms perfect seal with plastic conduit sheath.
- Protects conduit sheath against damage.
- Blue color gives visual installed insurance of a proper ground.



### INTEGRAL TAPERED BODY WEDGE

- Positive ground for metal conduit armor.
- Fits all thicknesses and convolutions in standard liquid-tight flexible metal conduit.
- Grounding member integral with body.

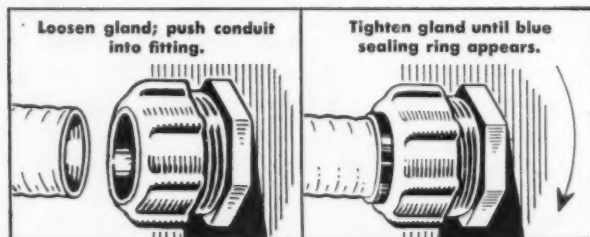
Seal out all moisture, oil, and corrosive fluids with this easy-to-install, self-grounding connector... a connector specially designed by T&B for Types UA and EF (J.I.C. Standard) liquid-tight flexible metal conduit.

Just push conduit into connector body and take up on gland nut until blue plastic ring appears. No need to disassemble connector. No twisting of conduit. Same wrench fits both body and gland.

Integral tapered body wedge positively grounds metal conduit armor. Plastic-to-plastic seal between gripping ring and conduit jacket makes tight leak-proof connection. Straight connectors, 45° and 90° elbows available for conduit from 3/8" to 2".

Send for sample and engineering data today.

### A CINCH TO INSTALL —



LOOK FOR THIS SIGN —



### IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

T328

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MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



## Current Limiting Fuses Clear Short Circuits in Less than

# *1/2 Cycle*

### ALLIS-CHALMERS Type H Starters

FOR 2300 TO 5000  
VOLT MOTORS

With Allis-Chalmers Type H Starters, your motors, cables and associated equipment are protected against short circuits by fast-acting current limiting fuses. These fuses cut off short circuit current at a *low safe peak value*. The short is cleared in less than a half cycle . . . thus minimizing the possibility of damage.

#### Noiseless, Safe, Positive

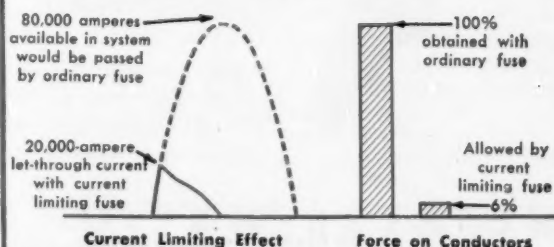
Action is silent. An indicator in the end of fuse reveals occurrence of short. Blown fuse emits no gas, flame nor vapor . . . discharges no metal. Flashover caused by ionized vapor is eliminated. Fuses will not blow unnecessarily . . . protection against locked-rotor or single-phase conditions is provided by overload relays coordinated with fuses.

#### The FULL Protection Starter

Quick action short circuit protection is a part of the *Full Protection* engineered into a Type H starter . . . complete, positive protection which permits men to work in safety, guards motors and machines against costly damage, lengthens equipment life, increases production by reducing down time. Get all the facts from your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

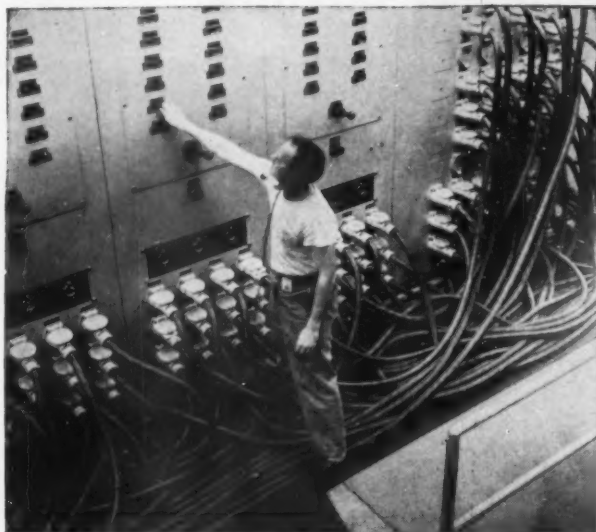
A-4368

### Compare . . .



# ALLIS-CHALMERS

# SPECIFY... PYLE-NATIONAL



QUELARC PLUGS and RECEPTACLES in seventy-two foot plug board installed in the General Electric Company's Light Military Electronic Plant in Utica, New York.

## PLUGS AND RECEPTACLES

### For More Efficient Plant Operation

**DETACHABLE COMPONENTS** On any equipment that must be disconnected for inspection, repair or replacement, plugs and receptacles quickly pay for themselves by saving man hours and shortening shut-down periods. Complicated multiple conductor connections are instantly and accurately broken and remade as polarization is not disturbed.

**PORTABLE EQUIPMENT** Located throughout a plant at all potential operating points, receptacles for plugging in electrical tools and other portable equipment, contribute greatly to the flexibility and efficiency of plant operation.

**PLUG-IN BOARDS** On power distribution panels and portable generators, plugs and receptacles provide a quick efficient means of selecting and routing electrical circuits to meet the special and varying requirements of testing and research operations.



**TRIPLOC\***  
Interchangeable and Reversible  
Series 250 volts, D.C.; 460 volts,  
A.C.; 2 to 12-poles, 15 and 20  
amperes also multiple unit types 2  
to 48-poles, 60 and 15 ampere  
combination circuits.

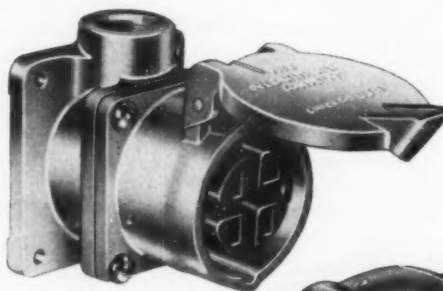


**MIDGET TRIPLOC**  
Interchangeable and Reversible  
Series 2, 3 & 4-poles; 10 amperes,  
250 volts; 15 amperes, 125 volts.



**STRATE LINE\***  
for Hazardous Locations — De-  
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\*Trade Mark Reg. U.S. Pat. Off.



**QUELARC\***  
Circuit Breaking Series  
250 volts, D.C.;  
600 volts, A.C.;  
2, 3 & 4-poles;  
20 to 200 amperes



Rugged insulation, positive polarization and grounding circuit provisions, meet strict safety requirements. Listed by Underwriters' Laboratories, Inc. Sold nationally through authorized electrical distributors. *Write for descriptive bulletins.*

## THE PYLE-NATIONAL COMPANY

1344 North Kostner Avenue, Chicago 51, Illinois

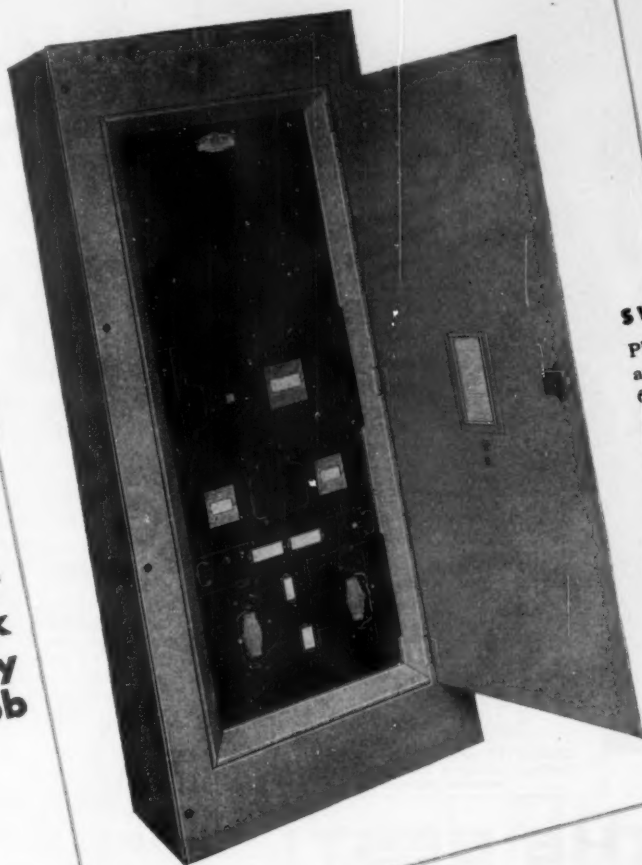
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**Order  
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Stock  
for  
Quick  
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### **switch capacities**

**PULFUZSWITCH** — 30 to 100  
amps, 250 volts and 30 and  
60 amps, 600 volts.

**KLAMPSWITCHFUZ** — 30  
to 200 amps, 250 volts AC or  
DC.

**SNUFARC** — 30 to 200 amps,  
600 volts AC, 2, 3 and 4 poles.

**Main Capacities** — 250, 400  
and 600 amps, 250 or 600 volts  
in six basic assemblies.

Above illustration shows "On  
the Job" assembly of combina-  
tion Klampswitchfuz and Pulfuz-  
switch Panelboard.



## **Feeder Distribution PANELBOARDS**

Ⓐ Pulfuzswitch, Klampswitchfuz and Snufarc feeder distribution panelboards are now available on the "panel base assembly" plan, which means that you can order these popular panelboards right out of stock for quick and easy assembly on the job.

All components of each type of panel — box, front, panel back, main bus bars and lug connections, neutral bar and 2 1/4 inch adjustable cover — are compactly packaged and are being stocked by Ⓐ distributors for the convenience of contractors, engineers and others. Switch units are separately packaged also.

Approved by the Underwriters' Laboratories, Inc., for label service, these panelboards are the finest in safety and efficiency. All switch units are of the operating type and horsepower-rated. They combine switch and fuse in one unit so that the current is "Off" when fuses are accessible. For maximum efficiency, all current-carrying switch and fuse contacts are heavily silver-plated and fuseholders clamp under pressure.

The next time you need a feeder distribution panelboard, ask for Ⓐ.

***Frank Adam Electric Co.***

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• For further information,  
see your Ⓐ distributor  
or consult a  
Ⓐ representative listed  
in Sweet's Industrial  
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Makers of: BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

## NEW PRODUCTS

### Leviton Heavy Duty Switches Meet Heavy Duty Demands



CAT. #5301

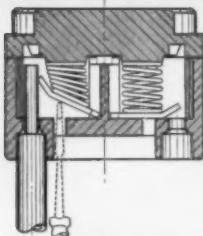
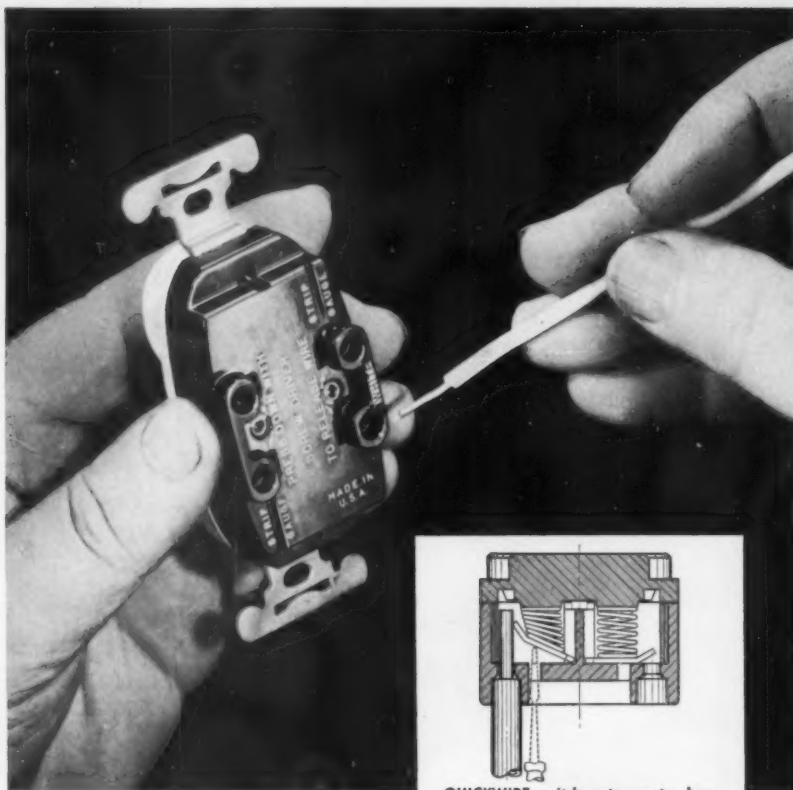
Permanent, solid-riveted construction enables Leviton Heavy duty switches to "take it". Double wiping contacts, of high grade bronze, and large terminal screws, properly angled for ease of wiring, provide switches of superior quality. Fully enclosed in heavily sectioned Bakelite... with plaster ears. Also available in single and double pole or 3-way. Rated 20 Amp. and meets UL and Federal Specifications. Individually packed, each Leviton Heavy Duty switch comes complete with wiring diagram on the box.

### LEV-O-LOCK Devices Assure Power Flow Without Interruption



Connections that *cannot shake loose* when subjected to jarring motion or vibration are possible with LEV-O-LOCK devices. A simple turn of the cap locks cap and connector or receptacle quickly — and tightly. Sturdy construction features assure long life and latest design makes wiring fast and simple. Interchangeable with other standard interlocking devices, LEV-O-LOCK devices are listed by the Underwriters' Laboratories, of course. Available in 2, 3 and 4 wire 10 and 20 Amp. Caps, Connectors and Receptacles.

For complete information write Leviton Manufacturing Company, Brooklyn 22, N. Y.



QUICKWIRE switch—cutaway to show  
Leviton's exclusive heavy coil spring  
pressure connector.

## EASILY THE BEST!

— Quick and easy installations are done best with

## NEW LEVITON **Quickwire**

spring type, screwless terminal switches and receptacles.

**QUICK** — because there are no wire loops to make, no screws to loosen and tighten. **EASY** — because you simply strip the wire and push it into hole. **BEST** — because Leviton's **exclusive** heavy coil spring connector holds the wire in place firmly, making permanent contact. To release, simply insert a screwdriver into the release hole.

You save time, money, labor costs when you use QUICKWIRE spring lock switches and receptacles. Simple, easy-to-read instructions are molded into the Bakelite on each device. Deeply recessed wire wells prevent exposure of bare wire. Fully enclosed housing, plaster ears, and handy strip gauge marking on each device.

QUICKWIRE receptacles are available in brown or ivory phenolic. Switches have either brown or ivory toggles and the same famous Leviton switch mechanism — known for service and dependability the world over. And both devices meet UL, CSA and Federal Specifications, of course.

Your best jobs are done with...

# LEVITON

For full information write:

**LEVITON MANUFACTURING COMPANY • BROOKLYN 22, N. Y.**  
Chicago • Los Angeles • Leviton (Canada) Limited, Montreal  
For Best Results Use Wire By AMERICAN INSULATED WIRE CORPORATION

# Two Ways To Improve Your Next Explosion-Proof Installation!

## KILLARK Flexible Couplings ... for safer wiring in vibration areas

If you're hanging explosion-proof fixtures in an area of excessive vibration, or if you're installing motors that vibrate — then you need Killark Flexible Couplings for the job. They're explosion-proof, won't shake loose, are U. L. approved.

- Base and fittings of solid brass.
- All combinations of hubs.
- Conduit diameter from  $\frac{1}{2}$ " to 2" — any length.

We will make up the particular coupling you want — and get it off to you quickly. Remember, where vibration is worst, Killark Flexible Couplings are best!



## KILLARK GRH Series Explosion-Proof Junction Boxes ... for easier wiring on *big* jobs

Available in big, roomy sizes — up to 11"x12"x7 $\frac{1}{2}$ " — but light in weight. That's because they're made of Killark's exclusive Alumatloy, the 20th century metal. Large 9 $\frac{3}{4}$ " cover opening allows plenty of convenient hand room for easier wire splicing. Hubs from  $\frac{1}{2}$ " to 4" — in any position you desire.



**XJB**  
Extra Large Fitting  
With bolted cover  
(26 $\frac{1}{2}$ " x 14 $\frac{1}{3}$ " x 8") is  
now available — with  
hubs in any position.



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**To fill the gap...**

# **I-T-E announces a compact, new 400-amp KL circuit breaker**

**ENCLOSED TERMINALS** mean extra safety for personnel... reduce possibility of phase-to-phase faults.

Built like the versatile 'K' frame breaker—but with almost *twice* the capacity—the new 400 amp. 'KL' frame breaker fills the gap between present 225 and 600 amp. frame molded case circuit breakers.

For applications which formerly required the use of the larger, more expensive 'L' frame breaker, you can now use the new 'KL' frame breaker—*up to 400 amperes!*

All these I-T-E extra-quality features too:

1. **Thermal-magnetic tripping**  
gives complete protection against overloads and short circuits.
2. **Quick-make, quick-break contact action**  
assures long breaker life.
3. **"Common trip" operating mechanism**  
opens all poles simultaneously when there's an overload on any one pole.
4. **Interchangeable trip units**  
provide continuous rating versatility from 125 to 400 amperes.
5. **"Trip-free" handle mechanism**  
prevents breaker from being held closed against faults.
6. **Three-position handle**  
indicates whether breaker is ON, TRIPPED, or OFF.
7. **Special auxiliary devices**  
such as shunt trips, undervoltage trips, auxiliary switches, and alarm switches are mounted *inside* the breaker case.

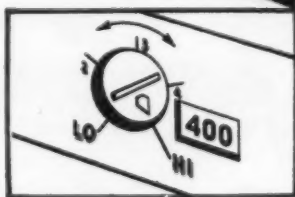
Available in ratings from —

125-400 amperes

2- and 3-pole

600 volts a-c; 250 volts d-c

25,000 amperes interrupting capacity (NEMA)



**EXTERNALLY ADJUSTABLE INSTANTANEOUS TRIPS** provide 5 different magnetic trip point settings. Adjustable to *specific* applications.



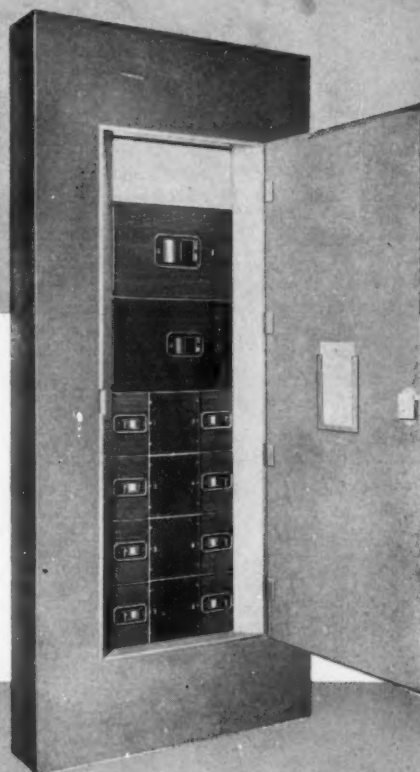
# Gives 400 amp. capacity... in less space than previously required

in panelboards • switchboards • motor controls  
individual enclosures • bus duct plugs



## EASY ACCESSIBILITY

“KL” breaker can be mounted quickly in distribution-type panelboards, power panels, bus plugs, combination motor starters, and all types of individual enclosures. Solderless pressure-type terminals are easily accessible for quick cable connection.



## SIMPLIFIED SWITCHBOARD MOUNTING

Rear connecting studs facilitate mounting. Allow easy front removal of breaker. Safe—saves time.

***Save time, save space, save money...***

***without sacrificing quality***

Standardize on I-T-E circuit breakers to assure service continuity, simplified maintenance, a single source for system expansion or replacements, and the same proved I-T-E dependability throughout. For details, write to I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.



# Molded Case Circuit Breakers

Take the

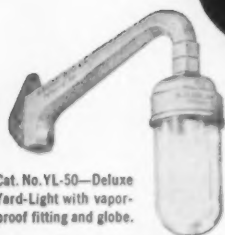


to Extra Profits!

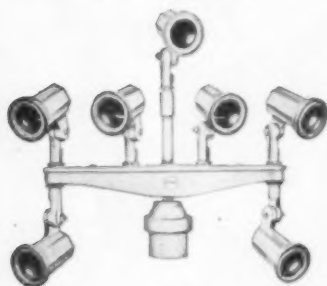
Maximum Flexibility for Endless Combinations  
to Meet Every Lighting Need with Minimum  
Stock Requirements!

*Eye-Appealing in Beauty...  
Budget-Appealing in Price!*

## LAMP HOLDERS AND ACCESSORIES



Cat. No. YL-50—Deluxe  
Yard-Light with vapor-  
proof fitting and globe.



Combination of No. 134  
Trough, 7 No. 136 Lamp  
Socket Units, No. 138 2"  
Pipe Slip-Fitter, No. 190  
4" Extension.



Cat. No. YL-40—Deluxe Yard-  
Light with green and white  
enamel shade.



Cat. No. 177—Y-Type  
Flange Splice Box.



Cat. No. 175-B—All Metal  
Spotlight Holder com-  
plete with 6' cord, rub-  
ber plug. Furnished with  
separate weatherproof  
gasket, with spike.



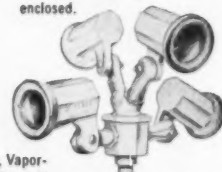
Cat. No. 137—Mogul  
Base Holder fully en-  
closed with 20" fixture  
wire.



Cat. No. 136—Lamp  
Holder for PAR-38  
Bulb, wired with 20"  
fixture wire fully  
enclosed.



Cat. No. 230, 231, 232, Vapor-  
proof globe fittings; No. 207  
Y Type acorn.



Comb. No. 207 Y-Type  
Acorn, 4 No. 136's.



Cat. No. 206—Acorn  
Splice Box with remov-  
able lid.

Cat. No. 144—Curved  
Splice Box with remov-  
able cover.



Cat. No. 120—for PAR-  
38 or GE-R40 200-watt  
low price completely  
enclosed wire unit.

**M. BLACK**  
MANUFACTURING COMPANY

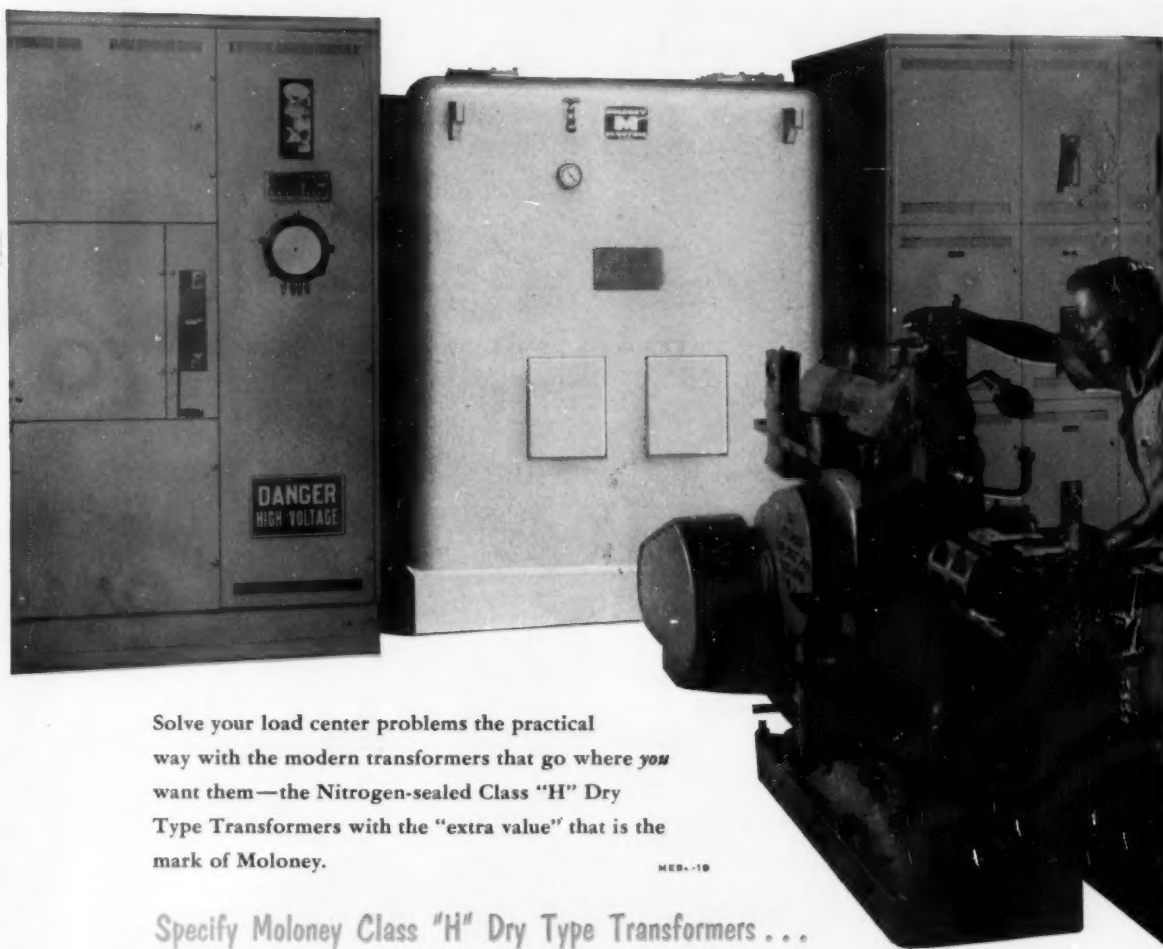
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# Eliminate Maintenance

Since Moloney Class "H" insulated Dry Type Transformers are nitrogen-sealed, maintenance is eliminated. They cannot produce toxic gases, never need expensive vault installations and the nitrogen atmosphere protects insulation from oxidizing. This results in longer, more dependable transformer life.

Moloney Nitrogen-sealed Class "H" insulated Dry Type Transformers offer you more protection against fire and explosion hazards. These versatile and dependable transformers can be located indoors or outdoors *right next to the job* and more than meet the most exacting insurance requirements. And this also means important savings in costly copper connections... less danger of accidental power interruptions.



Solve your load center problems the practical way with the modern transformers that go where *you* want them—the Nitrogen-sealed Class "H" Dry Type Transformers with the "extra value" that is the mark of Moloney.

MED-19

Specify Moloney Class "H" Dry Type Transformers...



**MOLOONEY ELECTRIC COMPANY**

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

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# Progress is built



Fairbanks-Morse  
will also continue  
to supply electric  
motors in old  
NEMA frame sizes.



# ...brick by brick

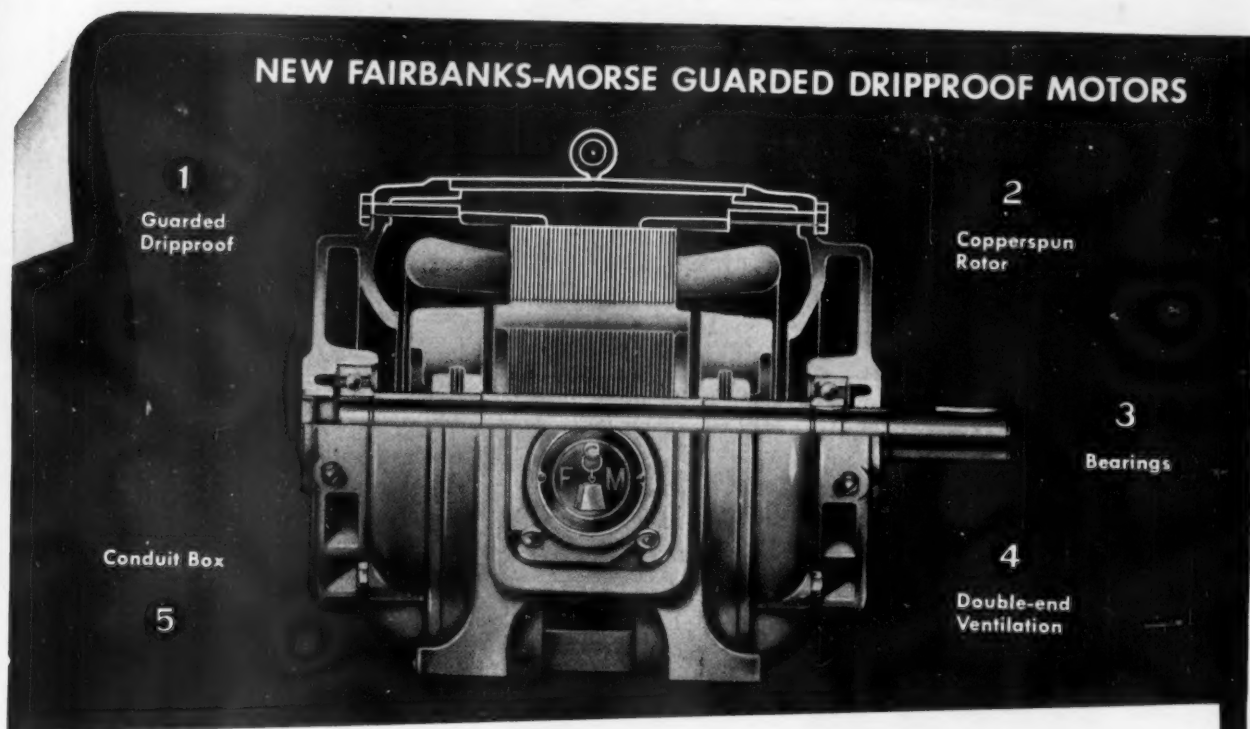
The new NEMA Standard for electric motors is a significant sign of progress to all industry—More Power in Less Space.

**But progress—to be lasting—must be built brick by brick** For more than a century, Fairbanks-Morse designers have held to the ideal of more performance in less space. They have produced outstanding advancements in the design of diesel engines, pumps, scales, locomotives and the many

other products that feature F-M exclusives. Fairbanks-Morse electric motors built on this basic F-M engineering philosophy are continuing assurance of operating economy and efficiency.

Look for the electric motor that stands on this Fairbanks-Morse solid foundation of design progress. It carries the Fairbanks-Morse Seal of Quality.

## NEW FAIRBANKS-MORSE GUARDED DRIPPROOF MOTORS



**1** Guarded, dripproof construction keeps falling objects and dripping liquids out of motor in any mounting position—maximum motor protection under conditions of wet or dirty operation—indoors or out.

**2** Exclusive Fairbanks-Morse feature that provides a virtually indestructible one-piece rotor—homogeneous, free from flaws and gas inclusion for maximum strength and lifetime service.

**3** Oversized, precision ball bearings in spacious housings, sealed against grease leakage. Contain ample lubrication for extended periods of rugged service. Convenient flushing and re-lubricating available if desired.

**4** F-M exclusive design eliminates hot spots. Cooling outside air is drawn into motor through openings in lower portion of both bearing arms and circulated through cored passages in the frame.

**5** New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive recess feature allows elimination of conduit box where space is limited.



**FAIRBANKS-MORSE**  
a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES  
AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME  
WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

*for time-saving,  
money-saving*

# POWER DISTRIBUTION

## SQUARE D TOTALLY ENCLOSED FEED-IN DUCT

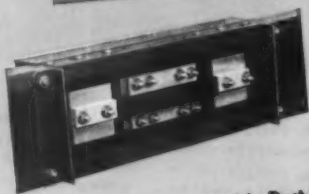
is the most efficient way to transmit large amounts of power. It provides the lowest known voltage drop—only 1.8 volts per 1000 amperes per 100 feet.

Exclusive design requires no ventilation—permits a totally enclosed, compact, dust-excluding enclosure. Rigid construction provides high resistance to heavy electrical stresses.

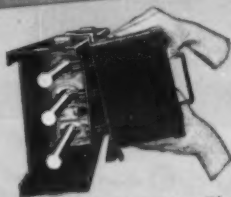
## SQUARE D EXPANSION CONNECTED PLUG-IN DUCT

provides flexible power distribution for branch circuits. Machinery can be rearranged quickly at minimum cost. Plug-in units can be attached at frequent intervals along the length of the duct, providing power where it's needed, when it's needed.

## BUSWAY FEATURES PROVE DESIGN LEADERSHIP



**NEW JOINT DESIGN.** Feed-in Duct joint design saves installation time and reduces maintenance cost. Duct ends are identical—unnecessary to select mating ends before positioning or hanging duct sections. Outward-facing, pre-installed bolts permit rapid assembly and easy maintenance.

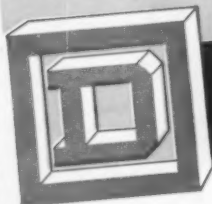


**ROUND BUS BARS** for Plug-in Duct provide greater mechanical strength and resistance to short-circuit stresses. Circuit breaker or fusible type plug-in units are easily installed at 2-foot intervals along both sides of the duct. Plug-in stabs grip the round bus bars with exceptionally high pressure.

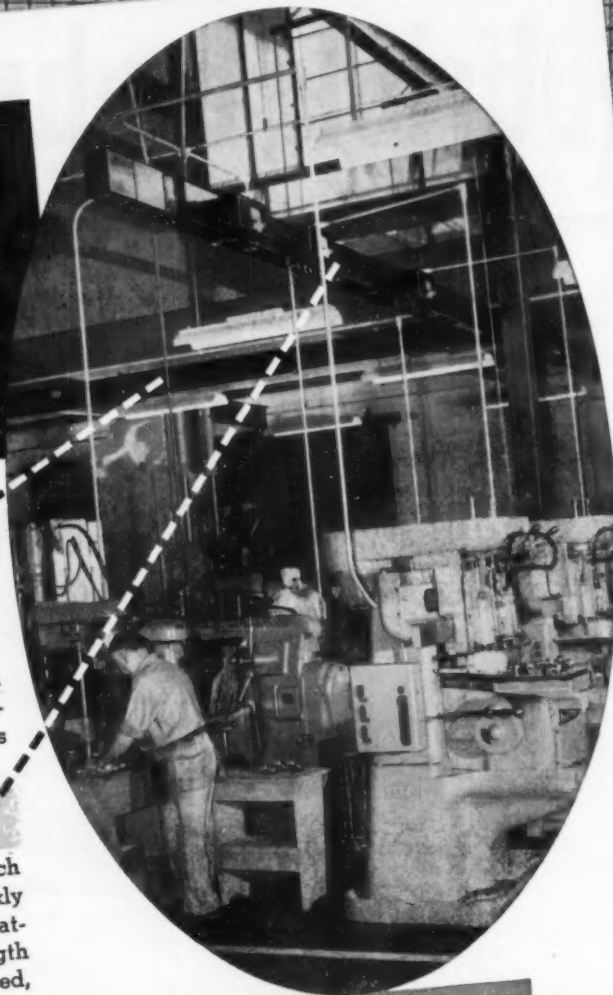


**EXPANSION CONNECTORS** of laminated copper join bus bars between sections—permit proper alignment, insure tight joints and provide for expansion and contraction at Plug-in duct joints. All bolt heads face outward for greater accessibility.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



# SQUARE D COMPANY



# Washington Report

---

**Business outlook for balance of 1954** is optimistic, and the President's mid-August prediction for a business upturn this fall is proving accurate. Nearly all economic indicators reflect stability, with slight upturns occurring in many fields as summer vacations end, manufacturing returns to normal, and seasonal up-swing adds steadiness and firmness.

Here are some of the reasons for business optimism:

- **New building construction** continues to boom, is sure to set a new record this year. Outlay for July was record \$3.5 billion; for first seven months was a record \$20.1 billion.

- **New housing starts** are at a pace second only to record year of 1954. July starts were 112,000, bringing total for year up to 687,000 as compared with 678,000 through July, 1953.

- **Income to individuals** in June was at annual rate of \$286.7 billion, down only \$900,000 from June 1953's \$287.3 billion annual rate, and is expected to set new records during the next three months.

- **Employment in July** was 62,150,000, up some 50,000 from June, Census Bureau reported. Also, unemployment had stabilized in May at about 3.34 million, or 5.1% of the total labor force, had changed little through August. Unemployment during first half of 1950 was 6.2%, a year earlier was 7.6%.

**Close down of Congress** does not mean all official Washington is on vacation. Work goes on, and major decisions are in the offing. Budget Bureau is mapping out a Federal spending program for fiscal year beginning next July. Treasury is working on revisions to the new tax bill as overhauled and passed by the 83rd Congress, while Bureau of Internal Revenue tries to work out rules and regulations for the new tax law. National Security Council has a new top level task force reviewing cold war strategy and making appraisal of Red menace and existing foreign policy. Final report of this group will affect spending for future defense. Defense costs during current fiscal year will be about \$36 billion.

**The nation's largest cities** are setting new records for taxing, spending and piling up debt, Commerce Dept. has reported. In 1953, total revenue for 481 cities with 25,000 or more population reached a record \$7.099 billion, or 8% above 1952. Spending reached \$7.281 billion, also 8% more than in 1952. Borrowing, at \$1.222 billion in 1953, raised the city debts outstanding to a record \$11.3 billion, or \$730 million above 1952 levels.

**Copper shipments** in July were 97,436 tons, with sales brisk and price firm at 30 cents a pound. Steel production is continuing at rate of about 65% of capacity, based on annual capacity of 124 million tons, reflects slowdown in auto production and major appliances. Aluminum output in June totaled 120,680 tons, compared with annual capacity of 1,540,000 tons.

**Electric power output** during first half of 1954, at 227.1 billion kwhr, exceeded 1953's first half by 5.3%. Last year's rate of gain over 1952 similar period was 11.4%. This dip in rate of gain in 1954 is attributed primarily to a slowdown in industrial power consumption.

Output for most areas this year are about equal to 1953's output, except for the Southeast where it has been running about 18% ahead of 1953. Heavy use of power by AEC, plus some increase by private industry, are cited as reasons for the Southeast's higher rate. A new national record was set for three weeks successively during July-August, when production topped 9 billion kwhr per week.





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maintenance and replacement. Add them all up and see why you're ahead with "Magna-Flo" Systems (individual unit or continuous line)—because "Magna-Flo" excels by ALL QUALITY STANDARDS!

This chart gives some of the important reasons why:

## "MAGNA-FLO" CUTS INSTALLATION COST

wide variety of knockouts facilitate wire entrances into unit.

complete line of sliding hangers.

single, rugged channel coupling for continuous mounting.

## "MAGNA-FLO" CUTS MAINTENANCE COST

Porcelain Enamel reflecting surface is easy to keep clean with soap and water.

exclusive "Springlox" lampholders make possible "quick-in, quick-out" lamp maintenance.

Speedy, exclusive "Lok-Latch" reflector fasteners.

## "MAGNA-FLO" CUTS OPERATION COST

made for efficient utilization of high light output T12 Slimline lamps.

high power-factor ETL-approved ballasts for continuously-cool, efficient operation.

high reflection factor remains constant because genuine Porcelain Enameled reflector does not discolor or become dull with age.

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# SEPTEMBER . . . . at a Glance

**GARDEN APARTMENTS**—Multiple dwelling units with garden apartment site planning helps to bring low cost mass production techniques to construction while avoiding the drabness of unvarying uniformity in appearance.

The Desire Street Housing Project in New Orleans, La., is a large scale job on which a basic unit wiring layout was carried out on a mass production basis by electrical contractor Walter J. Barnes. A close-up of the wiring layout and installation methods in a typical unit is described by Mr. Barnes in "Electrical Details in a Housing Project", page 82.

**BUS FABRICATION**—Fifty tons of bus bar hooking up the tanks of a 500-foot long automatic plating machine to 14 large plating generators and three selenium rectifiers challenged the Howard Electric Company to tackle the enormously complex site fabrication and installation job with typical Detroit ingenuity. A mobile field fabrication shop fully mechanized with power tools was set up alongside the plating machine and moved along with the installation. C. Robert Howard describes the tools and field assembly methods in "Power Tools Slash Bus Fabrication Time" beginning on page 72.

**ELECTRIC CEILINGS**—The use of electric ceilings at Douglas Aircraft Co., in their new Engineering Office building in El Segundo, Calif., August

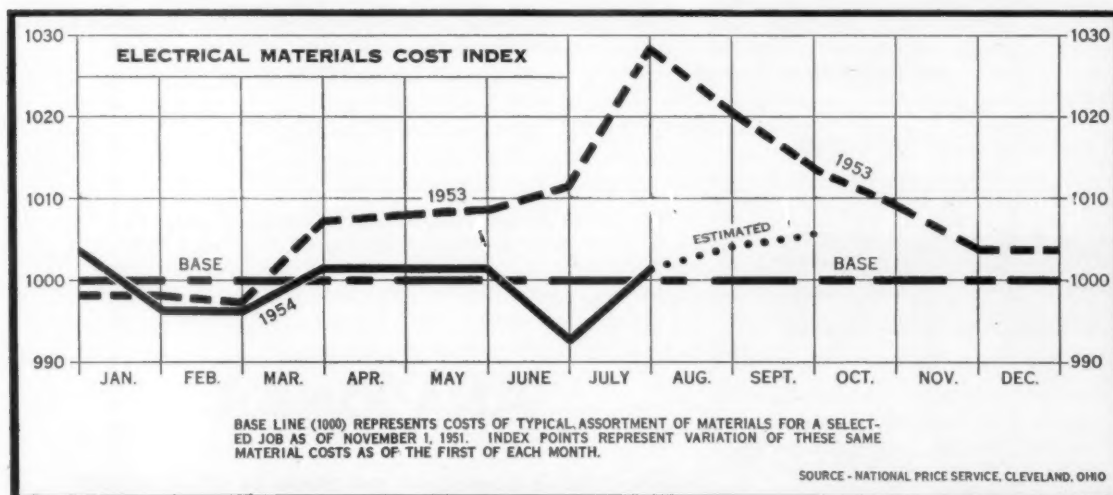
Electrical Construction and Maintenance (page 63), greatly broadens the horizon for electrical construction work. Further, it establishes a new high reference point for the ratio of electrical work costs to total construction costs. It provides lighting, and has six other typical building services built into it. The important aspect of this job is that the electrical contractor was responsible for the installation of the entire ceiling, embracing all seven electrical and mechanical features. This boosted the electrical contract portion of the job to at least three times the conventional volume rate, and made Hoffman & Jacobs, Inc., who did this job, responsible for work cutting across several other building trades. Through inter-local union negotiations all problems were agreeably resolved, and Hoffman & Jacobs officials and workmen are to be complimented on the pioneering work they handled so successfully on this project.

**TOUCH BUTTONS**—Several developments in switching devices have appeared in recent years, all directed toward silencing or simplifying the mechanical effort required to operate an electrical circuit. A unique new device developed for elevator calls now requires no mechanical motion at all. The call is registered by just touching a fixed button. Tiny electronic tubes respond to the touch and operate the associated circuit. See "Electronic Touch Button", page 88.

**MART REWIRES**—Chicago's famous Merchandise Mart, the world's largest commercial building, like many of its contemporaries has outgrown its original wiring system installed in 1930. New 480-volt stairwell risers will feed transformers at existing lighting cabinets to handle overload conditions which have become increasingly critical, particularly during the great annual furniture and houseware shows held there.

Last year consulting engineers Sargent and Lundy designed a supplementary distribution system to eliminate overloads and provide spare capacity. The new electrical system was furnished and installed by Continental Electrical Construction Co. See "More Transformer and Feeder Capacity", page 69.

**EFFICIENT MIX**—Five wiring methods were used by Chapel Electric Company for secondary distribution on an industrial project for Standard-Thompson Corp. near Dayton, Ohio. The electrical layout designed by Schweiger, Heap & Associates, consulting engineers, employed conduit and wire, interlocked armored cable, trolley duct, bus duct and cellular floor systems each worked into the overall plan to exploit the special advantages of each method for the design objectives. The installation and the diverse mounting and installation problems encountered are described in "Five Distribution Methods in One Plant" beginning on page 97.





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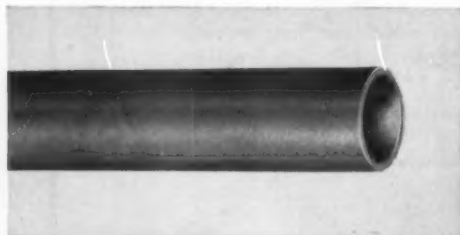
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## ***Productive Maintenance***

Some of the best minds in electrical maintenance have long deplored the traditional separation of the maintenance function from the production process in the eyes of top management. Effective and efficient maintenance operations pay off in lowered production costs, not necessarily in lower maintenance department budgets.

**The relationship** is widely accepted in principle. But when it comes to obtaining substantial cash for parts and spares, or beefing up the night crews, the specifics don't always follow the principle. Managements are inclined to review such requests in the limited content of maintenance department operations and miss the more relevant influences on overall manufacturing costs.

**Powerful help** is on its way in a broad educational program recently launched by the General Electric Company to encourage *productive* maintenance. The program has a frankly commercial plug for the G-E service shops. But it is so broad and fundamental in its approach that it deserves industry-wide attention. It tackles the production-maintenance relationship objectively and head on.

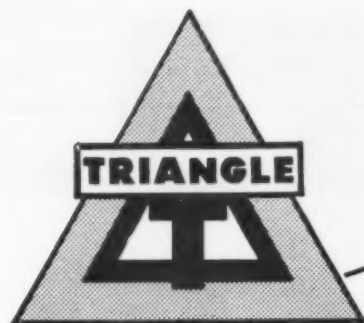
**The physical plan** in part is much like some of the better preventive maintenance programs in fairly wide use today. It proposes a system of records and scheduling of maintenance routines. But inherent in the system is a method of evaluating for critical maintenance which gives realistic weight to the cost of unscheduled down-time against scheduled overhauls or equipment replacements.

**Maintenance costs** are relative in the growing complexity of manufacturing processes. Machinery and equipment involve very high ownership costs which are a function of time. They cost as much idle as running. If productive maintenance can minimize unscheduled down-time, the value of such maintenance becomes readily apparent.

**The trend in production** is toward automatic and interdependent operation. Investments are higher. Bottlenecks or down-time influence ever larger groups of interconnected apparatus. The ratio of maintenance personnel to operating personnel is also rising. In some highly automatic plants it is already 50-50. Trouble shooting and repairs after breakdown can still serve quite satisfactorily for much independent electrical equipment. But for critical and interconnected processes every probability must be anticipated, evaluated and planned-for.

**Automatic processes** are pushing the maintenance department into a position of major and ultimately controlling responsibility for production. Sound plans, systems and methods need formulation, development and application to provide uninterrupted, scheduled production with planned down-time to avoid intolerably expensive unplanned emergency breakdowns. The new "productive maintenance" program is an impressive and useful step in that direction.

*Wm. T. Stuart*



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GLAZON WIRE—Types R, RP, RH-RW  
TRIOSEAL WIRE—Type TW  
RUBBER COVERED WIRE—  
Types R, RP, RH-RW

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Sheathed Cable (Type TW insulation)

SERVICE ENTRANCE CABLE  
SERVICE DROP CABLE  
ARMORED CABLE  
DUPLEX CABLE—Types RD, RHD-RWD

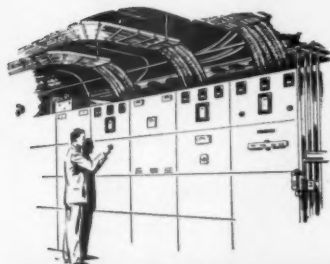
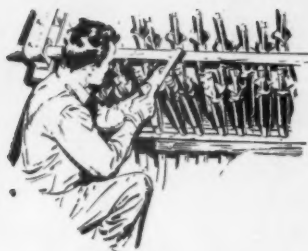
### **CONDUIT**

RIGID—Hot Dipped Galvanized or Black Enameled

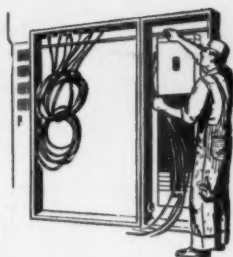
TRISTEEL—Flexible Steel Conduit

THIN WALL CONDUIT (E.M.T.)—Electro-Galvanized

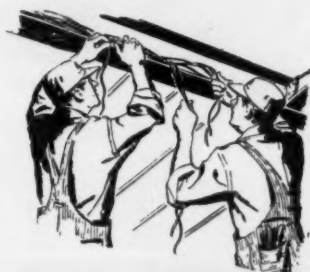




*For*  
**INDUSTRY**

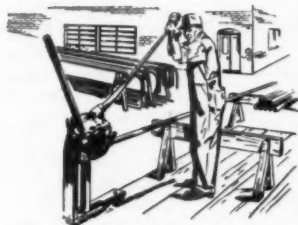
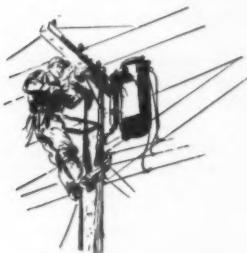
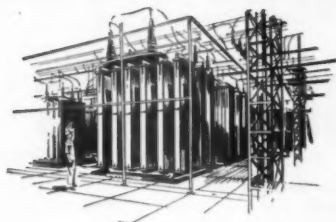


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**EXISTING LIGHTING SWITCHBOARDS** on ninth floor distribution center bore the brunt of serious system overloads. Pedestal fans cool the rear mounted fuses and bus bars. This condition was relieved by . . .

## ELECTRICAL CONSTRUCTION AND MAINTENANCE



**NEW SERVICE FACILITIES** on first floor. Here, Roy Witz of Continental and chief electrician James Clark check switchgear.

# Addition of More Transformer and Feeder Capacity

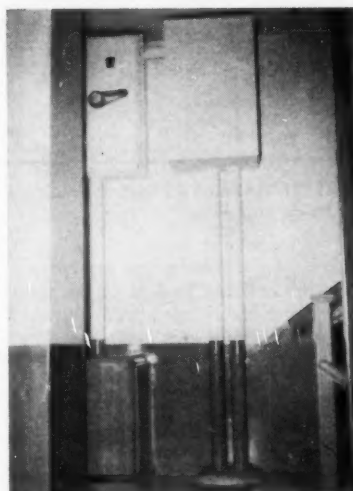
. . . eliminates lighting system overloads at Chicago's Merchandise Mart. Higher voltage stairwell conduit risers, installed by Continental Electrical Construction Company, feed step-down transformers at existing lighting cabinets.

**O**VERLOAD conditions on the lighting distribution system at the Merchandise Mart in Chicago are being corrected by an electrical modernization program involving the addition of transformer capacity and new higher voltage feeders to existing lighting distribution cabinets. When re-wiring is completed, the first eight floors of the entire building will be fed from the new facilities. The remainder of the 18-story structure (reputedly the largest commercial building in the world) will be served by existing transformer and switchboard equipment on the ninth floor.

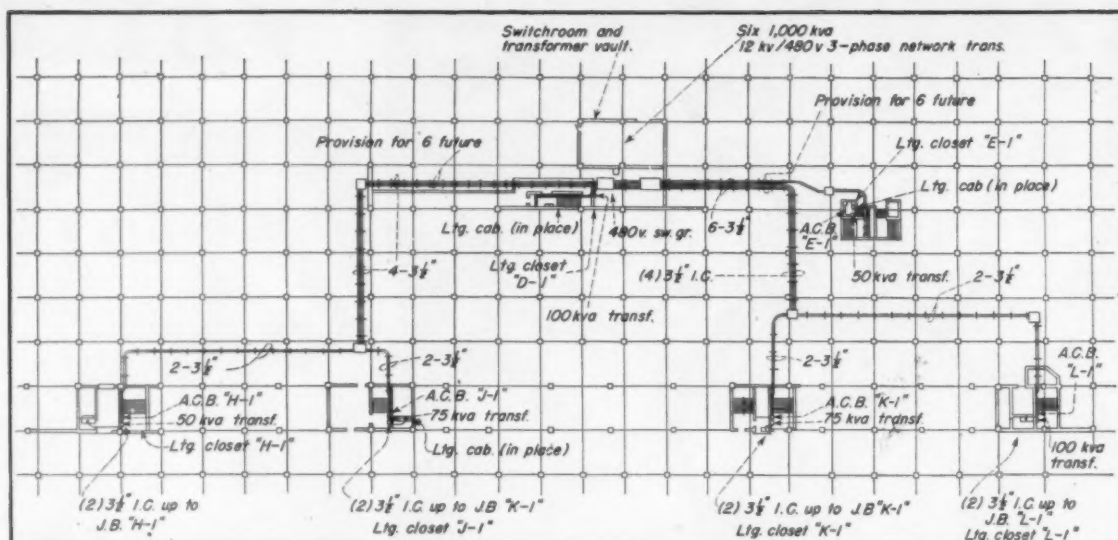
Like most commercial buildings built 20 to 25 years ago, the Mart (completed in 1930) long ago outgrew its original electrical system capacity. New vaults and equipment were installed for the central air conditioning system. A separate 440-volt, 3-phase distribution system serves the power

requirements. As lighting intensities increased and tenants demanded more current for their office and display areas, the ninth floor electrical facilities were expanded. New transformers, breakers and switchboard equipment were added until there were ten 1,000 kva units serving the single-phase, 3-wire, 110/220-volt distribution system feeding branch circuit cabinets on each floor in 11 riser shafts throughout the building. Even this move was not enough. The load was still growing and overloads were increasing. Conditions were especially critical during the annual furniture and housewares shows held at the Mart.

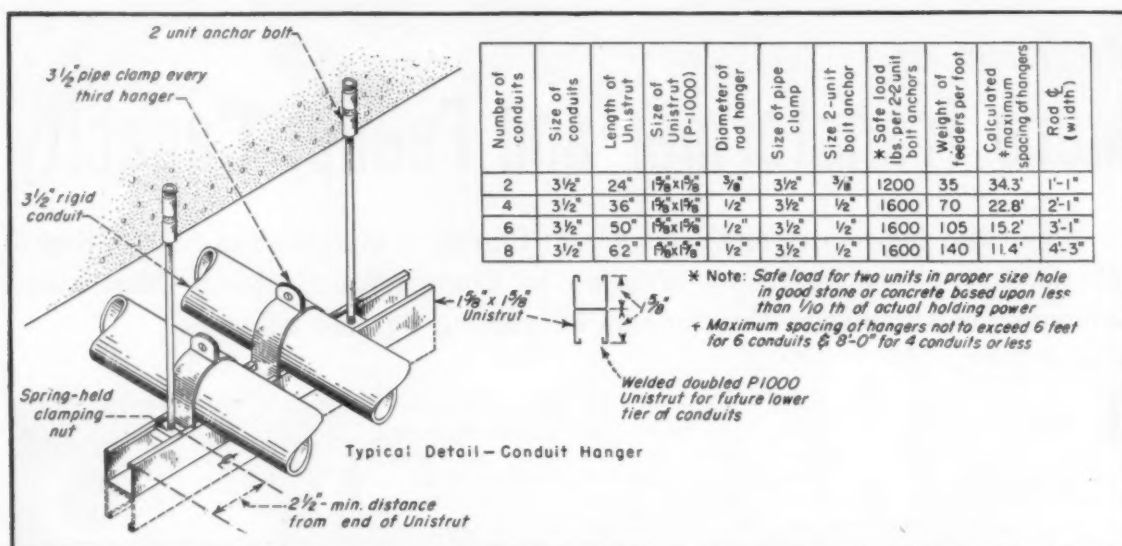
Last year, management had Sargent & Lundy, consulting engineers, survey the situation and design a supplementary distribution system that would eliminate the overloads and provide a substantial measure of spare capacity.



**PARALLEL FEEDERS** in stairwells have splice box on alternate floors; serve single-phase 480/110/220-volt transformer on cork-floor pad.



**BASIC PLAN** of new feeder system to six existing electric closets and shafts on first floor. Parallel feeders continue as risers up through stairwells to eighth floor.



**TRAPEZE HANGER DETAIL** for multiple conduits fanning out from switchboard room. Note double Unistrut bar to accommodate future conduit runs.

S & L's recommendations basically divide the building in half at the ninth floor level for lighting load purposes. Existing equipment will serve all lighting from the ninth floor up. New vaults and switchboards in the first floor loading dock area provide 480-volt, 3-phase distribution to the basement and first eight floors. Single-phase transformers step down the voltage to 110/220 volts at each electrical closet to feed existing branch circuit panels.

One half of the new system, involv-

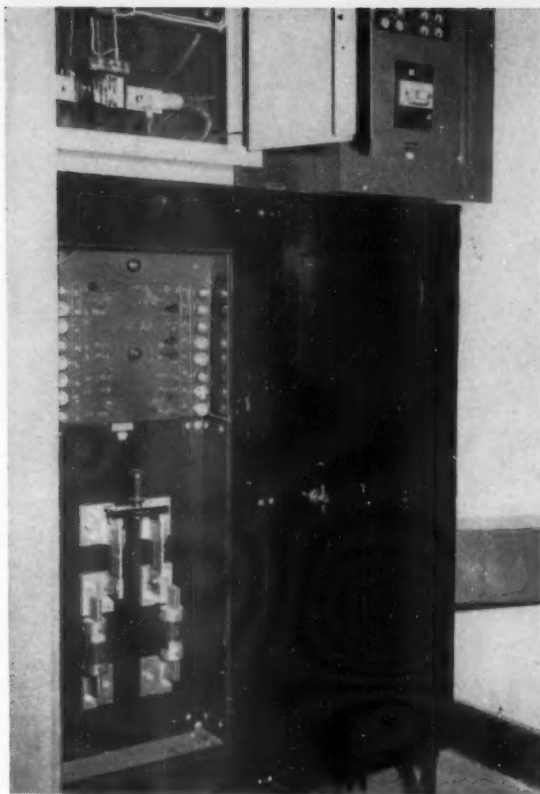
ing service to six of the 11 electrical shafts, was completed early this year by Continental Electrical Construction Company. A total of six 1,000-kva, 12-kv/480-volt, 3-phase network transformers in the new utility vault serve a secondary distribution board (Westinghouse) consisting of a 5,000-ampere main breaker with six 800-ampere feeder breakers. Space and an overhead pull-box in the new switchroom provide facilities for the addition of a second switchboard when additional transformers are installed to

serve the remaining five electrical shafts.

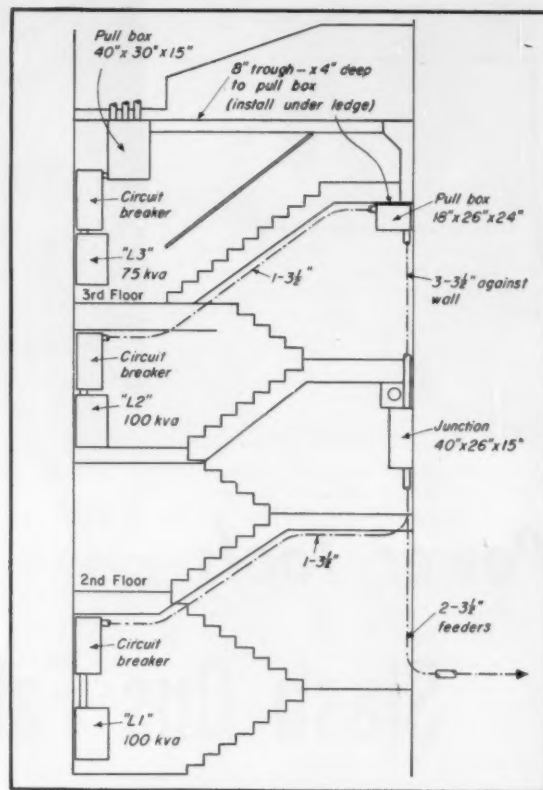
Secondary feeders originate at the 800-ampere breakers; consist of six 600 MCM cables (two per phase) in two parallel 3 1/2-inch conduits which fan out and continue up eight floors as risers near the existing electrical closets. At present, 12 conduits leave the switchboard pull-box on trapeze hangers specially designed to accommodate six additional future conduits of the same size.

Biggest problem encountered by





**EXISTING LIGHTING CABINETS** in closet adjacent to stairwell feeder are connected to transformer through wiring trough. This closet has some 88 branch circuits serving approximately 16,800 square feet of tenant space.

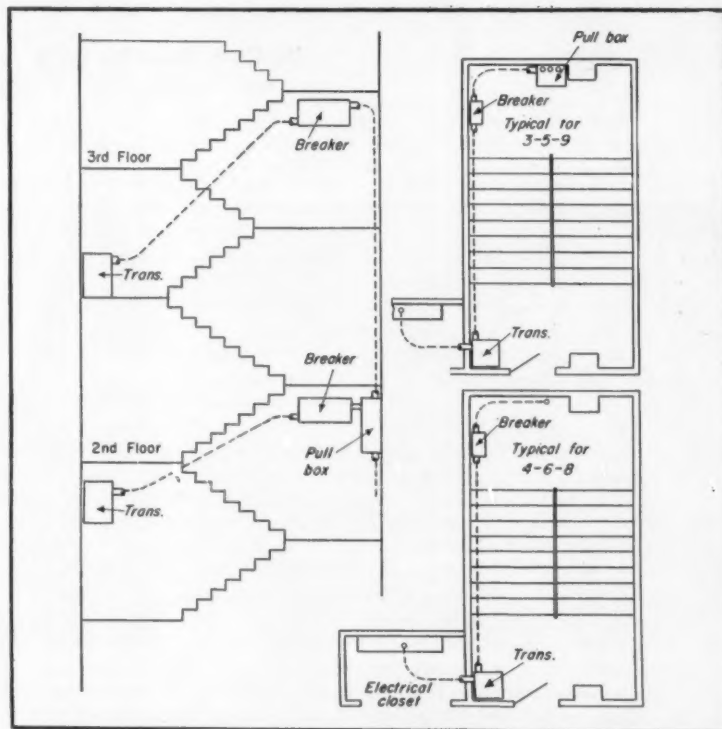


**STAIRWELL DETAIL** showing equipment location and conduit routing where risers occur on opposite side of stairwell from transformers. Note use of wiring trough where risers cross area.

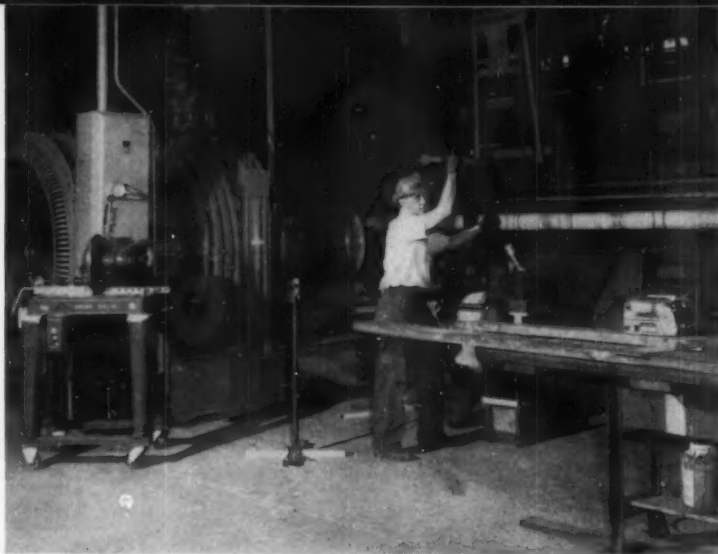
Continental's field engineers was routing the feeder conduits and finding space for installation of the step-down transformers (ranging from 50 to 100-kva) with their protective circuit breakers and pull-box connections. Stairwells adjacent to existing electrical shafts were used to advantage since they provided the only clear space for risers and equipment. To expedite installation and eliminate confusion in the field, Continental prepared 12 detailed shop drawings showing exact routing of conduits and location of equipment in these areas.

The Mart now has 6,000-kva of additional transformer capacity and a more flexible lighting feeder system to alleviate overload conditions. When the rest of the planned system is installed, the new facilities will relieve the old equipment of approximately 50% of its original load and there will be capacity for future growth.

**MOUNTING FACILITIES** varied with conditions found in stairwells. Here, breakers installed under quarter-landings feed transformers installed on wall or floor on opposite side of stairwell.



**1** **MOBILE FABRICATING SHOP** is set up in installation area to cut material handling and mechanic "travel"; can be moved from place to place as job progresses.



## Power Tools

# Slash Bus Fabrication Time

... for Howard Electric Company on large plating installation.  
Mechanization is heart of field assembly methods.

**By C. Robert Howard**

*Howard Electric Company, Detroit, Michigan*

**J**UDICIOUS use of power tools in a well-organized field fabrication shop has simplified bus bar installation for Howard Electric Company of Detroit. Copper bars are cut to length in a matter of seconds. Contact areas are cleaned and silver-plated in a matter of minutes. Pre-assembled multiple-bus sections are installed in a jiffy.

Results like these were achieved in a typical Howard project—a large plating installation in a Detroit automotive plant. The unit is a Udylite Corporation straight-line, fully automatic, continuous plating machine measuring some 500 feet in length. Fourteen massive generators (from 2,500-ampere to 15,000-ampere capacity) plus three selenium rectifiers (from 500-ampere to 2,000-ampere capacity) serve the unit. Voltage ranges from 6 to 12 volts for the copper, nickel and chromium

plating work on automobile bumpers.

In addition to wiring all control equipment (alternating and direct current), solution pumps, automatic conveyors and tram-rails, Howard mechanics installed some 50 tons of copper bus bar ( $\frac{1}{2}$  in. by 4 in.,  $\frac{1}{2}$  in. by 6 in.) from generators and rectifiers to plating tanks. About 40,000 contact areas were prepared (cleaned and silver-plated) for 20,000 connections. Approximately half of these junctions were of the bolted type (four holes per bar, total of 40,000 bolt holes); others were made with bus bar clamps.

To complete the project within the allotted time, a mobile field "shop" was set up alongside the plating unit so bus fabrication could follow installation progress. Power tools were used wherever a saving in time could be made without sacrificing quality workmanship. In general, sequence fabricat-

ing operations on quantities of bus bar were performed in the following order:

**Cutting**—on a conventional bench-type, cut-off saw equipped with a 10-inch diameter, 80-tooth blade operating at 1,800 rpm Sul-Flo oil was used as the cutting lubricant. Saw is powered by a 3-hp, 3-phase, 220/440-volt motor. Actual cutting time per bar averaged less than one minute.

**Punching Holes**—with a single-die, lever-operated hand punch on a stand, after bar has been marked by a 4-point center-punch template. Both Howard and Udylite engineers felt that punching produced a cleaner bolt-hole than drilling. Under consideration, now, is the motorization of the punch table and the addition of a multiple-hole punch and die set.

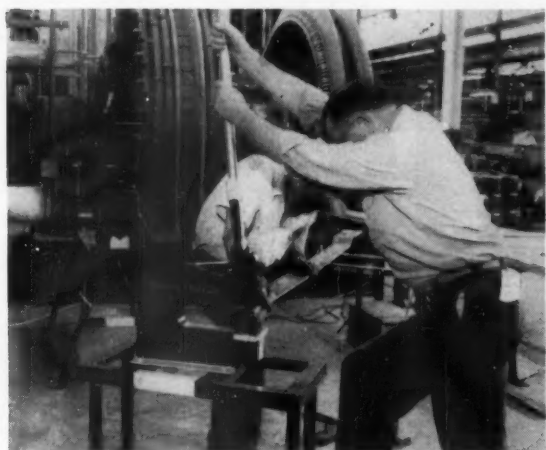
**Bending**—with a table-mounted hand bender. Because of the limited dimensional tolerances of closely-



**2 CUTTING BUS BAR** on power cut-off saw is first sequence operation. A 10-inch diameter, 80-tooth blade is used with oil lubricant. After bars are cut they go to.....



**3 CENTER-PUNCH TABLE** where four hole-positions are marked simultaneously with four-point gage. One blow with hammer is sufficient. Marked bars then go to.....



**4 HOLE PUNCH STAND** with lever-operated single-die mechanism. Plans to motorize this unit and equip it with multiple-die and punch set are being considered. Punched bars then travel to.....



**5 BUS BAR BENDER** mounted on bench vise. Hand operated unit is preferred for better control over bends to meet close dimensional tolerances of multiple-bar assemblies. Next step in sequence is.....



**6 CLEANING BUS CONTACT** areas with portable belt sander. Unit has a 3" x 10" belt of 80-grit emery cloth; cleans both sides of bar. Final step is.....



**7 SILVER PLATING** of bus contact areas with a portable brush electro-plating unit. Brush is dipped in silver nitrate solution then brushed across bar leaving silver deposit.



**8** INSULATING SUPPORTS of hard maple are fabricated in quantity in the field shop. Mechanic is drilling pre-cut cross-blocks using steel bar jig to maintain accurate spacing.



**9** TYPICAL BUS SUPPORT shown by job superintendent Lloyd C. Hart consists of four hard maple blocks with maple spacers (left) bolted to a steel framing-channel bracket.

spaced parallel bar assemblies, Howard engineers and mechanics prefer hand bending to power bending, contend the operator has more control over the bend.

*Cleaning* faces of bus bars at contact areas with a conventional (home workshop variety) motorized, portable belt sander using a 3-in. by 10-in. belt of 80-grit emery cloth. Operation is considerably faster than hand sanding and the obsolete draw-file methods.

*Silver-Plating* of contact areas with a portable brush electro-plating unit operating at 115 volts alternating current with a direct current output range of 1 to 20 amperes at 2 to 10 volts. Plating "brush" is a pure silver anode (on handle) covered with a cloth "glove". Anode is dipped in silver nitrate solution, then "brushed" across face of bus bar leaving a deposit of silver on the copper. Plated band on both sides of bus is one inch wider than copper bar to be connected. If connections are to be made within a short time after plating, no protective coating is added; otherwise a layer of petroleum jelly is applied to the plated area. Silver-plating method is considerably faster than tinning.

Field fabrication was not confined to copper work alone. Bus supports and insulator blocks were made on the site to meet job conditions. Steel brackets were cut to required length on a metal-cutting band saw. Hard maple stock was ordered to specified cross-sectional dimensions from the mill; also were pre-cut, finished maple spacers. Blocks were cut and drilled to required size in the field and assembled into insulator supports as the bus installation progressed.

Evolution of this field operation is the result of years of installation experience in the somewhat specialized electroplating field. During that time, Howard construction engineers carefully studied and analyzed every phase of bus bar fabrication and assembly. As new and improved power tools became available, tedious hand operations were progressively mechanized. Even now, ideas garnered from outside sources are combined with the "imagineering" of Howard personnel. Each new concept is put to test and experiment; weighed against possible job and installation conditions. Once an idea is proved feasible, it becomes part of the established field operation. But that is by no means final. A future project may incorporate several new techniques. For the firm engages in a constant "methods research" to produce higher quality workmanship and better installation efficiency.



**LARGE PANEL** fluorescent luminaires are installed in suspended ceiling to light offices of Charles S. Martin Distributing Co., Inc., Atlanta, Ga., and may be installed in any of the 2-ft by 4-ft ceiling grill rectangles as required for varying lighting results.



## Light Converts Shop Area Into Office

**Atlanta electrical contractors sell quality lighting job designed for maximum flexibility as key to conversion modernization of industrial area.**

**C**ONVERSION of a shop and warehouse space of irregular shape into a well designed and comfortably lighted combination office and appliance display room was the problem presented to Bales & Womack, Inc., Atlanta, Ga., electrical contractors. This all started when Mr. Martin of the Chas. S. Martin Distributing Co., Inc., Atlanta wholesaler and distributor of household electrical appliances, a former customer of the electrical contracting firm of Bales & Womack, called them in to survey the existing wiring in the old building to see if it was adequate for office use.

The old lighting system was for warehouse and shop use only, and totally inadequate for office lighting. Thus the need was for a higher level of illumination, of good quality, and suitable for various office areas as well as adjacent merchandising display areas. The system should also be flexible, and provide a uniform and pleasing ceiling pattern viewed from all directions, and of such design that it could be changed easily to conform to any changes in office or display areas.

The old structure presented many problems. Since it was originally de-

signed and built for shop and warehouse use, little attention had been given to appearance. It was irregular in shape, forming an obtuse angle parallelogram floor plan, and with irregular height ceilings varying from 18 to 28 feet in height. A sprinkler system existed at the 16-foot height from the floor, and columns for roof support were not in line nor plumb.

First, the decision was made to install a new suspended ceiling, ten feet above the floor. The existing sprinkler system would still be required to protect the area above the ceiling, so that a second sprinkler system would also be required for the area under the suspended ceiling. This introduced another grid work of pipe above the new ceiling.

An aluminum "T" channel grid framework system with 24-in. by 48-in. rectangles was installed to support the new ceiling. Acoustical spun glass panels and 24-in. by 48-in. fluorescent luminaires were inserted in the grid framework to form the ceiling and to provide lighting as required. Outlet boxes were provided at alternate rectangle channel grid intersections, supported by a messenger cable grid 14 inches above the channel

framework. Thus one electrical outlet permits a standard 24-in. by 48-in. fluorescent luminaire to be placed interchangeably in either of four adjoining rectangles without altering any wire connection. Branch circuits were run in EMT conduit, and made ample in size to permit tripling of the number of luminaires, should the owner desire additional lighting.

The present lighting consists of Day-Brite No. 44472 Mobilex luminaires installed on various centers as required to miss columns. In each luminaire there are four 40-watt G.E. cool white rapid-start fluorescent lamps. Each luminaire also has a hinged frame with Skytex diffusing glass panels. The resulting illumination is approximately 35 footcandles average, but additional units may be installed, or present units moved at a total time of about 20 minutes per luminaire. Total area lighted is 14,152 square feet, and the total connected load is 15 kw.

When the owner called in the contractor to discuss the lighting of this area, he had in mind spending about \$1500 for the job. It is interesting to note that the final job cost about eight times the amount originally planned, and the owner is highly satisfied.



**BEFORE**—This dingy interior relied mainly on natural light for general illumination. A few two-lamp industrial fluorescent units provided some local lighting. Business machines were crowded about scarce power outlets and operations were restricted by the small capacity of the circuits.



**AFTER**—Attractive working environment is achieved from the acusti-luminous ceiling, cool-green venetian blinds and light gray asphalt tile floors. Maintained lighting level is a uniform 50 ft-c. Surface metal raceway (arrow) radiating from columns and wall provide flexible power for IBM equipment.

↓  
electrical  
modernization

# Factory- to- Office Conversion

**Foresight of Becton, Dickinson and Company management pays off as long range modernization program delivers a well-lit, powered-up new office area.**

**I**NDUSTRY looks to the future. In modern manufacturing plants, production schedules must be determined months, even years, in advance so that proper types and quantities of raw materials will be on hand when needed. Equally important in meeting tomorrow's market demands, is the availability of the right machinery to handle the processing and an adequate electrical system to power these machines.

For this reason, foresighted manufacturers take a more logical approach to the electrical modernization problem than do residential and commercial property owners. That is, they arrange to modify or enlarge their plant's power system before a critical overload develops.

The Becton Dickinson and Co. of Rutherford, N. J. manufactures quality medical instruments and supplies. Their original building, a 4-story brick and wood, mill-type structure, had long

since proved inadequate to the company's growing space requirements. Five major buildings had been added to this plant over a period of years.

Having accomplished this expansion, B-D turned their attention to the original structure with an eye towards getting maximum use of its considerable area.

Three objective were set:

1. Establish a pleasant office area on the 17,000 sq ft fourth floor. This would be convenient to the executive offices on the fourth floor of the attached new building.

2. Provide a flexible wiring system for the ever increasing number of business machines in the accounting department, also to be located in the renovated area.

3. Replace existing 1-phase, 3-wire distribution in the old building with a larger 3-phase, 4-wire system.

In order to obtain most effective use of the maintenance force, the program was planned as a step-by-step operation. Most critical need was that of the accounting department for adequate wiring to serve its new IBM equipment.

#### Accounting Area

A separate 240-volt, three-phase service was brought in to supply the accounting section. At the fourth floor this riser entered a 200-amp, 3-phase fused disconnect switch. On the load side of the switch the mains were divided, one branch feeding a circuit breaker panel for five 240-volt, 3-phase machines, the other serving single phase IBM equipment and lighting. For the latter load, three 15 kva, 3-phase step-down transformers convert to 120/208-volt power. Two magnetic contactors provide master remote control for both the lighting and single-phase power and panel circuits.

Because of the uncertain nature of the office machine layout, surface raceway was run on the floor from the outlets to the nearest column or wall, then in conduit up to the plenum space above the new ceiling; there the conductors were spliced in a box to BX cables which ran home to the panel. Thus, floor outlet locations can be moved without going back beyond the conduit-to-raceway adapter at the base of the wall or column.

#### Office Lighting

Selection of a lighting system presented several problems in engineering and in economics. Since the existing ceiling consisted of unsightly wood beams and planking, a new, suspended ceiling was in order. This would

apparently necessitate costly changes to sprinkler system. Moreover, future installation of air conditioning was contemplated, so the new installation had to provide ready access to the plenum space with minimum labor.

After consulting with engineers from Public Service, the local utility, and Graybar Electric, it was concluded that a translucent louver ceiling of corrugated plastic offered the best answer. The Acusti-Luminus ceiling which was installed in the new office area combines the functions of providing a uniform light source and sound conditioning. Sufficient air space is available around the edges of the corrugated plastic sheets to preclude the need for air diffusers when air conditioning is installed; also, the easily removable panels will minimize duct installation costs. Since the vinyl plastic will sag and collapse at a lower temperature than the tripping point of the sprinkler heads, it was unnecessary to modify the sprinkler system.

Maintained lighting level is 50 foot-candles.

#### Three-Phase Feeders

The overall plan for modernizing the old building called for converting the distribution system to 3-phase, 4-wire, 120/208 volts.

On the fourth floor, new 3-phase circuit breaker panels were installed on existing risers to accommodate circuit wiring for the new luminous ceiling. Until 4-wire feeders are installed, the load on the third phase bus is split between the two connected phases.

One by one, the four lighting risers are being changed over to the 3-phase service as maintenance and production schedules permit. The new sub-distribution center in the basement was mounted close by the old single-phase distribution with the purpose of minimizing conduit work.

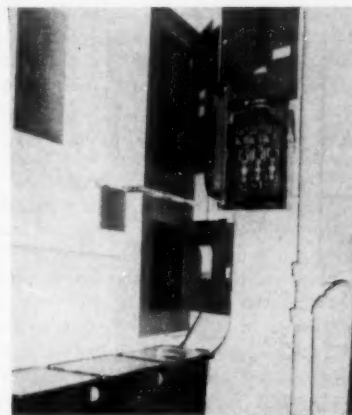
Lighting panels feeding off these four risers on the lower floors will be replaced with 3-phase units as the modernization reaches their respective areas and definite circuiting loads are determined.

#### Planning Pays Off

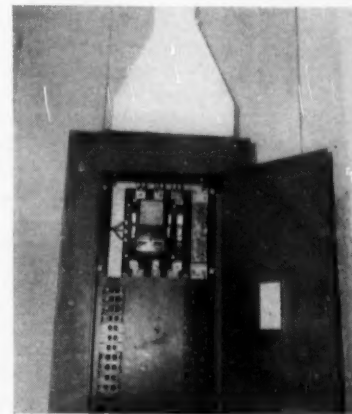
The Becton, Dickinson program presents a fine example of the rewards which may be gained by planning to meet future needs. Besides getting immediate use of a modern, attractive office area, B-D will achieve maximum utilization of a 48-year old building at a surprisingly low cost since there was no interruption to plant operations and maintenance personnel did all the work.



**MAINTENANCE ENGINEER, Kurt Kuhn,** who supervised entire modernization program, stands at plant's main switchboard. Primary (4160 v) breakers at right protect distribution transformers and secondary control centers opposite.

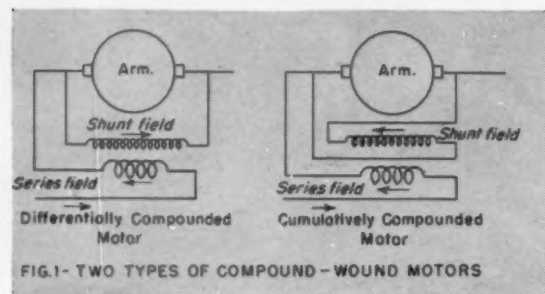


**CONTROL EQUIPMENT** for accounting section is fed through 200-amp main switch at 240 volts ac. Heavy, 3-phase IBM machines are protected by 30-amp, 3-pole circuit breakers in panel above switch. Single-phase, 15 kva step-down transformers convert to 120/208-v three-phase power for panels serving lighting and single-phase machines.



**MAGNETIC CONTACTOR** controlling lighting circuits can be operated from three remote locations. Trough at top conceals cables leading out of alcove into plenum space above luminous ceiling.

## AT THE TEST BENCH-4



Compound-wound dc motors are divided into two types according to the relationship between the magnetic fields set up by the series and shunt windings. If current flows through the shunt and series field windings in the same direction, the magnetic fields of the series and shunt windings have the same polarity and are additive in their interaction with the armature. With such an arrangement of fields, the motor is called a "cumulative motor." If the direction of current flow in the series field is in a direction opposite to that in the shunt field, the magnetic fields oppose each other and the motor is called a "differential" motor. Fig. 1 shows the two types of compound motors.

Magnetic flux of the compound motor is produced by current flow in both shunt and series fields. The shunt field is constant for any particular setting of the shunt field rheostat; but the series field carries the armature current and varies in strength according to load. When the series field adds its magnetic flux to that of the shunt field, motor torque increases for increases in load current.

The term "compound motor" usually refers to a cumulative motor. The differential motor is not so common as the cumulative motor and is used only in special applications. In a cumulative motor, fields must be properly connected to

# Reversing Compound Motors

By **Walter J. Prise**, Chief Engineer  
Queens Electric Motors, Inc., Jamaica, N. Y.

assure addition of series and shunt field flux. If a cumulative motor is connected and operated as a differential motor, the series field may get stronger than the shunt field, causing reversal of the direction of rotation. Such reversal might wreck the motor and/or connected machinery.

In a cumulative motor, the series field must always aid the shunt field for the motor to be cumulative at all times. The series field must at all times throughout the load cycle oppose the shunt field in a differential motor.

There are two methods of changing direction of rotation of a cumulative motor:

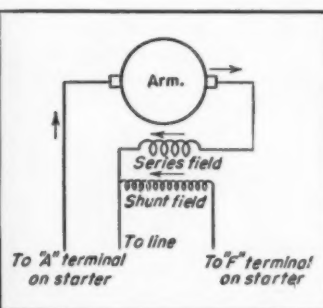
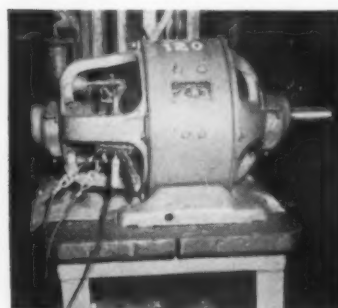
1. By changing direction of current flow in the armature. In this case, only armature leads are changed. The field connections remain the same.

2. By changing direction of current flow in both series and shunt fields. Armature connections remain the same.

NOTES: Reversing the armature alone reverses rotation but leaves the motor cumulatively connected.

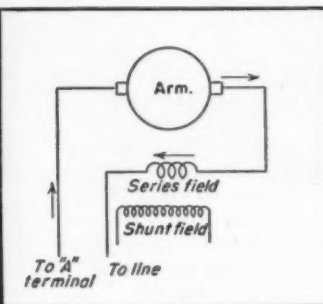
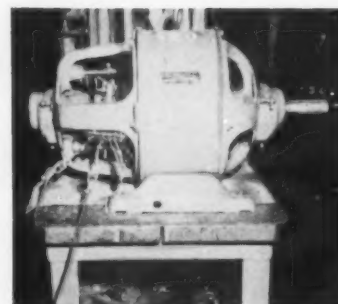
Reversing the shunt field alone reverses rotation but also makes the motor differential.

Reversing the series field alone changes the motor from cumulative to differential but leaves direction of rotation unchanged, unless the series field is too strong.



### STEP 1.

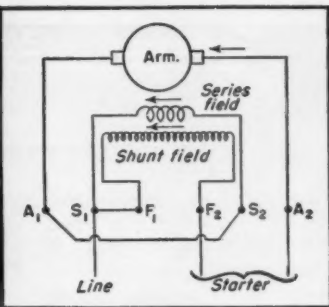
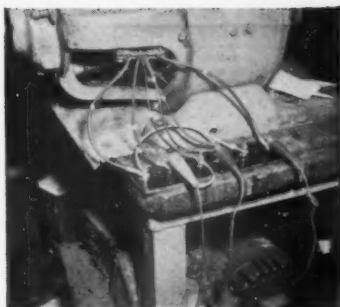
*Checking rotation with both fields.* Connect motor to three-point starter as a compound motor with both fields in the circuit. Let it run at no load. Under no load conditions, the motor functions effectively as a shunt motor, with most of the flux produced by the shunt field. Note the direction of rotation under these conditions.



### STEP 2.

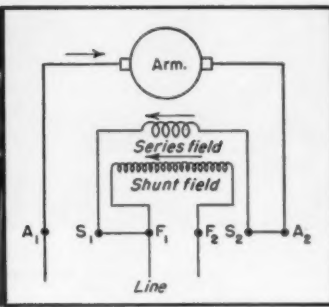
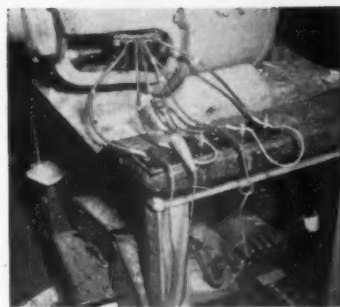
*Determining connections for cumulative motor.* Disconnect shunt field from the hookup and run the motor as a series motor with only the series field connected. If the direction of rotation is now the same as it was in STEP 1, the motor was cumulatively compounded in STEP 1. If rotation with only series field is opposite to what it was in STEP 1, the motor was differentially compounded in STEP 1; and series field connections should be reversed for cumulative operation.





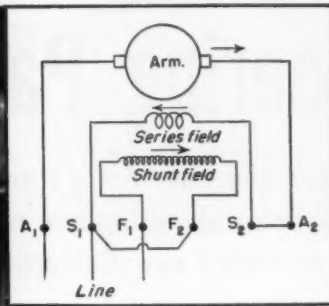
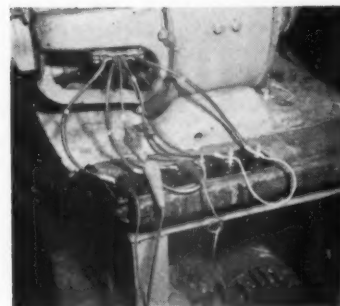
### STEP 3.

*Reversing rotation of motor by changing current flow in the armature. For this and following experiments, a terminal block is used. Armature leads are connected to terminals A<sub>1</sub> and A<sub>2</sub>; series field leads, to S<sub>1</sub> and S<sub>2</sub>; shunt field leads, to F<sub>1</sub> and F<sub>2</sub>. Various hook-ups can then be made by interchanging external connections on the terminal block. In the diagram, the current flow through the armature is reversed from that in STEP 1 by connecting the starter "armature" lead to A<sub>2</sub> and jumping A<sub>1</sub> to S<sub>2</sub>. S<sub>1</sub> and F<sub>1</sub> have a jumper and are connected to the line. F<sub>2</sub> is connected to the starter "field" terminal.*



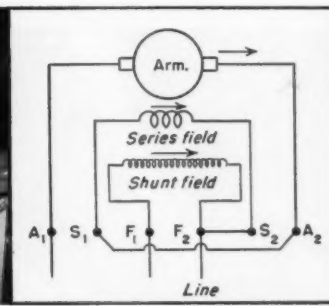
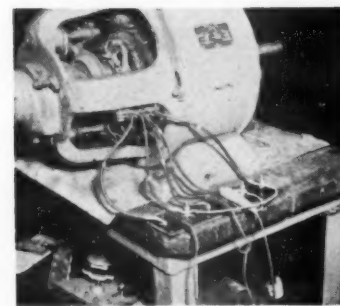
### STEP 4.

*Reconnecting motor as in original hookup, STEP 1. Starter "armature" terminal is connected to A<sub>1</sub>; S<sub>1</sub> and F<sub>1</sub> are joined and connected to line; S<sub>2</sub> and A<sub>2</sub> are connected together; and F<sub>2</sub> is connected to the starter "field" terminal.*



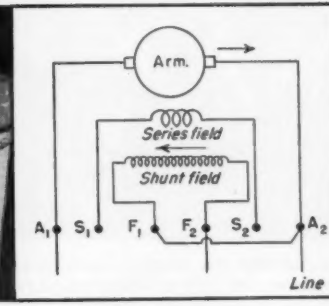
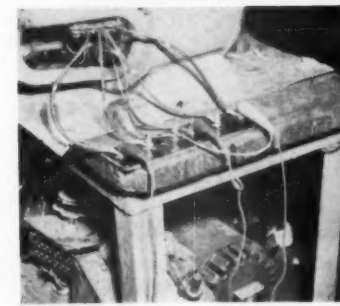
### STEP 5.

*Reversing rotation by reversing the shunt field. By connecting S<sub>1</sub> and F<sub>2</sub> together and to the line and connecting F<sub>1</sub> to the starter "field" terminal, the direction of motor rotation is reversed and motor is differentially compounded with the series field bucking the stronger shunt field.*



### STEP 6.

*Changing current flow in series field. By connecting S<sub>1</sub> and A<sub>2</sub> together, connecting F<sub>2</sub> and S<sub>2</sub> together and to the line and connecting F<sub>1</sub> to the starter "field" terminal, the current flow in the series field is reversed from what it was in STEP 5. As a result the motor is again cumulative although the direction of rotation is the same as it was in STEP 5.*



### STEP 7.

*Connecting motor for simple shunt operation. In this experiment the series field is disconnected from the circuit and the motor operates on only the shunt field. F<sub>1</sub> and A<sub>2</sub> are connected together and to the line; F<sub>2</sub> is connected to the starter "field" terminal; and A<sub>1</sub> is connected to the starter "armature" terminal.*



**MAINTAINED LIGHTING LEVEL** in assembly area is 35 footcandles at the working plane. Conduit work for lighting was minimized by running circuits in fixture channels using type AF wire. Conduit saddles between fixture runs were mass produced in the field shop.

## Job Engineering Pays Off

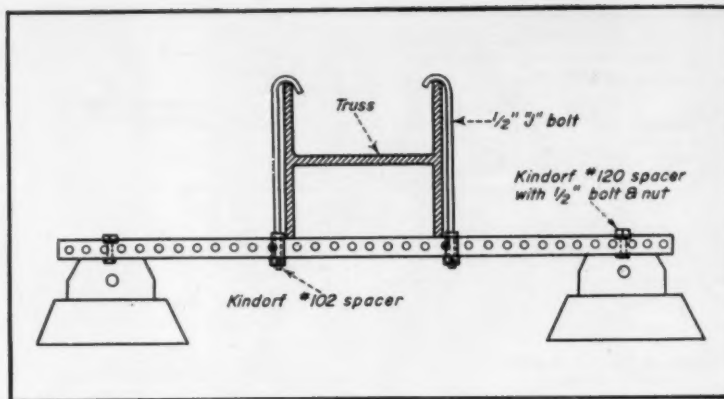
Close cooperation between the contractor's engineering staff and the field force brings tangible rewards in reduced job time and costs at Grumman Aircraft's new Calverton, N. Y. plant.

By **M. Lowenhardt**, *Supt. of Construction Div. Broadway Maintenance Corp., New York, N. Y.*



**LIGHTING MAINTENANCE** in low-bay shops and high-bay assembly area is achieved from baskets suspended under traveling cranes. Arrow shows one of two parallel runs of 400-amp, 3-phase plug-in duct extending the length of the building which provide a flexible power system for shops.

**HIGH-BAY FLUORESCENTS** are suspended on either side of the lateral truss member from facing perforated channel irons. Complete hanger unit, including  $\frac{1}{2}$ -in "J" bolts, was assembled at comfortable working level with two fixtures attached; then simply by hooking J's over truss and coupling fixtures to adjacent units, the hanging job was completed.



**THE ADMINISTRATIVE OFFICES** feature these forced-air, water-fed heating and cooling units. Filtered air is blown across a dense concentration of convactor tubes. An auxiliary air duct system provides fresh air and controls humidity.



**E**NGINEERING is part of the contractor's job. Even the best consultant cannot and should not be responsible for such design details as the routing of conduits, hanging methods, and location and size of pull boxes. These items are best accomplished by close coordination between the contractor's engineer and his foreman on the job.

Many contractors resent the additional work load placed upon their office staffs. At Broadway Maintenance, however, we have found that this seeming liability presents a real opportunity to achieve substantial savings in construction costs.

A good example of how thoughtful attention to details can pay off is afforded in our job at Grumman Aircraft's new Peconic River Plant at Calverton, Long Island.

It was necessary to devise some means of hanging the high-bay fluorescent units 20 inches off center on either side of the structural steel beams. The solution was simple, inexpensive

and since twin fixtures and their hanger could be assembled at a comfortable working level, there was a considerable savings in labor. Conduit work for the high-bay fixtures was minimized by running circuits through the fixture wiring channels using asbestos fixture (type AF) wire. Mass-produced conduit saddles connected the continuous rows of fixtures.

For bracket hangers for the multiple conduit runs along the steel-framed walls, we slotted the web of a short piece of angle iron and slipped it over the flange of a horizontal structural member so it stood out perpendicular to the wall. Welding the angle iron to the steel member gave us a substantial conduit support with little labor. Straps secured the conduit.

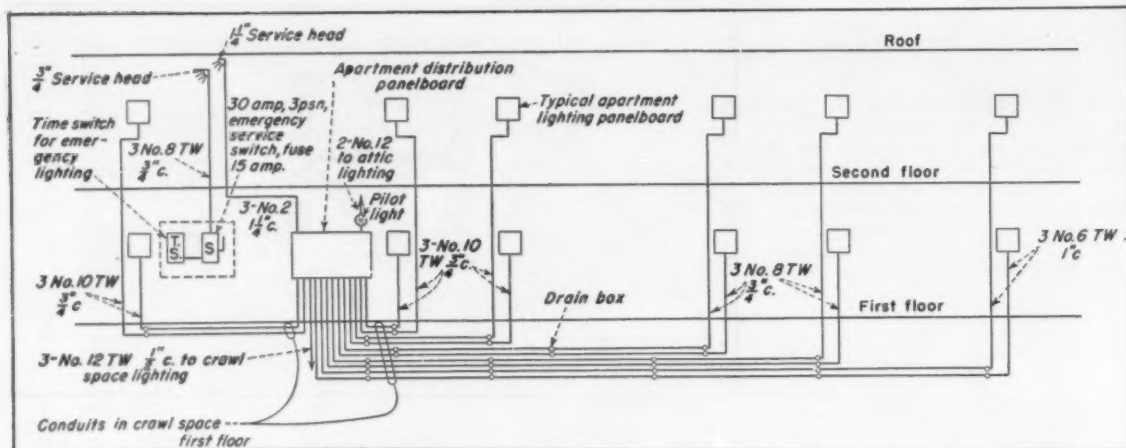
Three parallel pits running the length of the assembly area afford four different types of electrical services needed for aircraft production and testing. These systems are explosion-proof throughout. We used channel iron spacers attached to the

concrete inserts to bring the conduits out from the wall so they could be run straight into the cast boxes *without offsetting*. Conduits were secured to channel irons with Nelson studs and straps.

For pulling in feeders, we adopted rather an unusual technique. The vast open area of the building enabled us to bring winch-equipped line trucks right up to the various terminal and pull boxes. This, of course, resulted in a considerable saving in man-hours.

Although this precise planning of job details requires additional engineering work, the virtual elimination of errors and stoppages and the resulting savings in labor make this practice extremely worthwhile.

Broadway Maintenance performed this contract in cooperation with Charles A. Mulligan, Inc. of Central Islip, N. Y. Henry Wolfson was our inside engineer and Charles Cambria, field engineer. Superintendent on the job was Fred Faber.



# Electrical Details in a Housing Project

Closeup of wiring layout and installation methods in a typical unit of the large scale Desire Street Housing Project, New Orleans, La.

By Walter J. Barnes,  
Proprietor, Walter J. Barnes Electric Company  
New Orleans, La.

INTERIOR and exterior electric wiring on a mass production basis forms a major part of the construction of the large scale Desire Street Housing Project, New Orleans. Here, a basic pattern is used for wiring the multiple-dwelling units which make up this garden apartment project. Overall, electrical work includes installation of overhead primary distribution, street and yard lighting, services to buildings and inside wiring for apartments.

Service to each building is 120/240 volts, 1-phase, 3-wire. To the 12-apartment buildings, services are 3 No. 2 TW in 1 1/2-inch heavy wall conduit; to the 8-apartment units, 3 No. 4 TW in 1 1/2-inch heavy wall conduit are used. Within each building, circuits to various apartments originate at a 120/240-volt, 1-phase, 3-wire CB distribution panelboard. Feeders from this main panel to individual apartment lighting panels are in EMT. A typical riser diagram is shown in Fig. 1. Branch lighting wiring in apartments is No. 12 non-metallic sheathed cable, protected by 15-amp CB's.

Each building is also supplied from a second or emergency service for hallway lighting. This service—3 No. 8 TW in 1/2-inch rigid heavywall con-

duit—is time switched to turn lights on at dusk and off at dawn. This time switch and the emergency safety switch are mounted in a raintight cabinet on the exterior wall of the building. The time switch is synchronous-motor-driven, electrically wound with 10-hour spring carry-over reserve, rated 35-amp, 2-pole, with motor for 115-volt, 1-phase. The unit is equipped with an astronomic 24-hour dial.

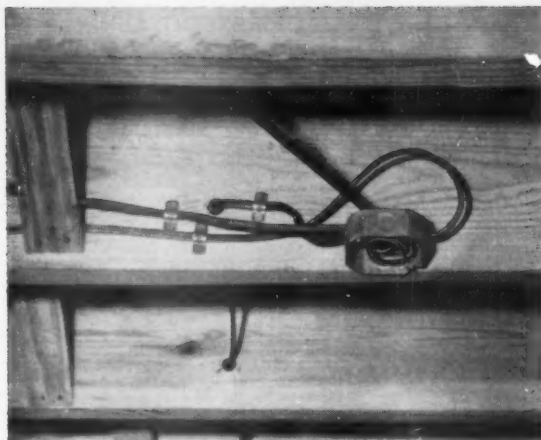
Horizontal runs of dwelling unit feeder-conduits in crawl space are provided with "weep" outlets as shown on riser diagram. These are type "C" fittings with porcelain covers which allow draining of any moisture which might collect in the trapped runs.

On this job, exterior work consists of: a 13,200-volt, 3-phase, 4-wire, grounded neutral, pole line primary distribution system; underground cable for secondary yard and street lighting system of pole mounted fixtures and yard standards; and pole mounted, oil insulated, self-cooled, 3-phase transformers for stepping the primary voltage down to 3 phases of 120/240 volts each for service to buildings. Street and yard lighting is also controlled by time switches. Metering of all electric energy for the project is done on the primary line.

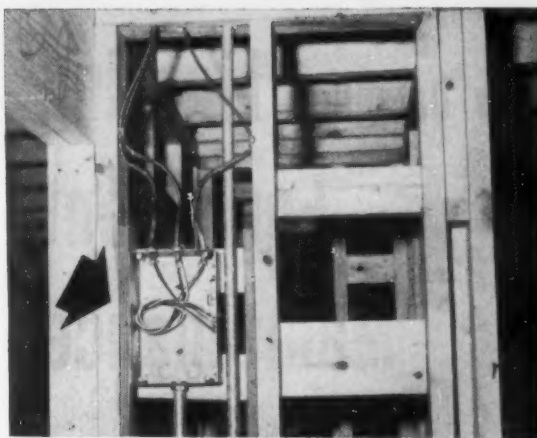


**LIGHTING OUTLETS** (arrow) are shown here mounted back to back between studs of wall which will separate front and rear stairwells. Boxes are fed in rigid conduit from outside emergency lighting cabinet.





**CEILING BOX**, mounted on bar hanger between joists and wired with non-metallic sheathed cable, is typical of branch circuit work throughout project.



**LIGHTING PANEL** (arrow) in first floor apartment is typical. Riser alongside box feeds lighting panel in second floor apartment. Both EMT risers come up from crawl space.



**INSTALLING CONDUIT** carrying feeders through crawl space under house, electricians here are clamping EMT runs to floor joists and adjusting "weep" outlets (arrow) to provide escape for any moisture which might collect in pipes which are sloped down to "weep" outlets.



**THINWALL CONDUIT** runs from distribution panel down into and along crawl space and turns up as risers to various apartment lighting panels. Conduit runs are trapped at "weep" outlets (arrow) which allow draining of any moisture from conduit.



**DISTRIBUTION PANELBOARD** in building hallway feeds all apartments through feeder CB's. Service entrance heavy wall conduit comes through building wall and into panel from outside service head. Main CB disconnect is at top of panel.

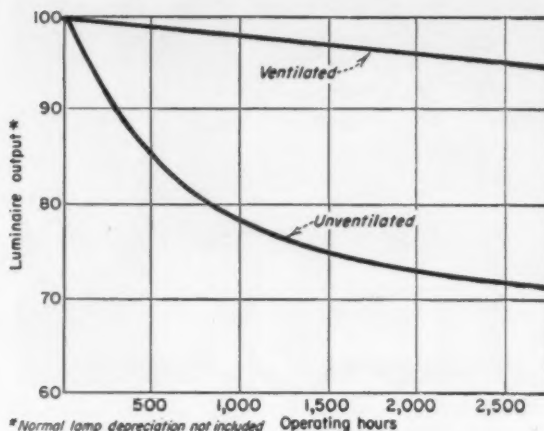
**BUILDING SERVICES** consist of regular service of 3 #2 TW in 1 1/4-inch heavy wall conduit (right) and an emergency hall-lighting service of 3 #8 TW in 3/4-inch conduit to a rain tight switch enclosure on outside wall.



# New Data On Lighting Equipment Maintenance

**Roundup of new light loss data, and information on rate of depreciation of luminaire efficiency when ventilated as compared with non-ventilated.**

CHART I. TYPICAL FLUORESCENT LUMINAIRES



\*Normal lamp depreciation not included

**VENTILATION** of reflector on typical industrial fluorescent luminaires affects light loss due to dirt on lamps and reflector.

**By J. Roy Jones\***

*Regional Engineer, Westinghouse Lamp Division, Los Angeles, California*

**S**CIENTIFIC measurements with elaborate photometric equipment have been made recently to develop new data on light depreciation for various types of luminaires under varying dirt conditions. These include lumen maintenance for various light sources, rate at which reflector light output diminishes, and degree to which luminaires depreciate under both clean and dirty conditions. These data are given in the accompanying charts and tables.

Lighting maintenance serves a double purpose. It improves the performance of a lighting system, and reduces the total overhead cost of the system. The maintenance program may also be simple. For example, it may be limited to: (1) systematic cleaning of the lighting equipment at regular intervals, and (2) group replacement of lamps prior to burnout.

## **Need for Cleaning**

Until recently, the conventional type of luminaire for industrial lighting has been the closed top, or "unventilated" type reflector unit. As shown by the lower curve in Chart I, this type reflector should be cleaned after approximately 1000 hours of operation, as its light output at that time has dropped below 80%.

A new trend in industrial lighting is

to use open top, or "ventilated" type reflectors which have slots near the top to allow air, heated by the lamps, to pass out—thus maintaining a slight circulation of air. This prevents a rapid accumulation of dirt, and the reflector will require cleaning less frequently. The upper curve in Chart I shows how light output stays high when ventilated.

Chart II shows depreciation of light output for typical high bay reflectors, first for reflectors installed in a dirty area (actually in a foundry in which the air contained the usual amount of smoke and dirt), and second for reflectors installed in a relatively clean high bay area. Both ventilated and non-ventilated reflectors were used. The curves dramatically illustrate the need for frequent cleaning of non-ventilated reflectors, as well as the improved efficiency of ventilated type high bay reflectors. Since only non-ventilated type high bay reflectors, for both filament and mercury vapor lamps, have been available generally until quite recently, most installations need regular and frequent cleaning to maintain in excess of 80% of initial, or clean condition, light output.

## **Group Lamp Replacement**

The principal advantage of replacing all lamps in a group rather than one at a time as they fail is that a big saving in lamp replacement labor costs are possible by the "mass production"

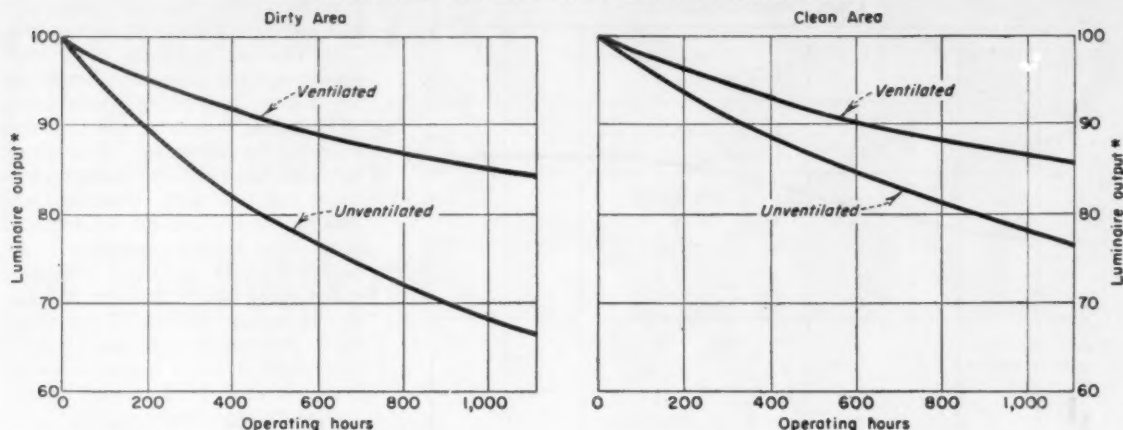
method. It is not uncommon to effect a saving of 50 cents per lamp replacement in fluorescent installations. Where the labor costs are usually higher, savings are correspondingly higher. These labor cost savings more than offset the remaining life value of the lamps that are discarded before they fail. Even though they may still be burning most lamps are worthless after they have burned their rated average life because of the depreciation in light output.

All lamps generate more light while they are new than they do after they have burned several hundred or a few thousand hours. Just as the efficiency of different types of reflectors depreciates because of dirt collection at different rates, so do different types of lamps depreciate in light output at different rates. Chart IV shows the rate of depreciation of light output for a standard 40-watt T-12 fluorescent lamp, and Chart V shows the rate of depreciation of light output for four types of mercury vapor lamps. Lumen maintenance of other general types of fluorescent lamps is similar to that shown for the 40-watt T-12 lamp; that is, general standard slimline and rapid-start type lamps.

The higher wattage filament lamps depreciate in light output faster than the lower wattage sizes. Approximate average light output throughout the rated average life for typical filament lamps is given in Table I.

\* Abstract of paper presented at 1st Western Plant Maintenance Conference, Ambassador Hotel, Los Angeles, California, July 13-14, 1954.

# CHART II. TYPICAL HIGH BAY LUMINAIRES



\*Normal lamp depreciation not included

**NON-VENTILATED** high bay reflectors in dirty areas (Chart at left) should be cleaned after about 500 hours, or in clean areas (chart at right) after about 900 hours, when luminaire output drops below 80% of clean condition.

## TABLE I. LIGHT SOURCE LUMEN AND LIFE DATA (For Lamps Commonly Used for Industrial Lighting)

Lamp Designation	Initial Lumen Output	Initial Lumens Per Watt	Mean Lumen Output*	Rated Average Life
<b>FILAMENT LAMPS</b>				
300-Watt PS-35	5,610	18.7	89	1000 hrs
500-Watt PS-40	9,900	19.8	89	1000 hrs
750-Watt PS-52	15,800	21.1	87	1000 hrs
1000-Watt PS-52	21,800	21.8	82.5	1000 hrs
1500-Watt PS-52	33,000	22.0	80.5	1000 hrs
<b>FILAMENT REFLECTOR LAMPS</b>				
800-Watt R-57	13,000	16.2	(**)	2000 hrs
800-Watt R-52	12,300	15.4	(**)	2000 hrs
550-Watt R-57	8,500	15.4	(**)	2000 hrs
550-Watt R-52	8,100	14.7	(**)	2000 hrs
800-Watt R-57 H-V	11,400	14.3	(**)	2000 hrs
550-Watt R-57 H-V	7,000	12.8	(**)	2000 hrs
<b>FLUORESCENT LAMPS</b>				
40-Watt Preheat & R.S.	2,560	64.0	84	7500 hrs
90-Watt Preheat	5,400	60.0	(**)	7500 hrs
96"-T-12 Slimline	5,190	70.0	84	7500 hrs
72"-T-12 Slimline	3,630	66.0	84	7500 hrs
<b>MERCURY LAMPS</b>				
400-Watt A-H1	15,000	37.5	86.6	6000 hrs
400-Watt E-H1	20,000	50.0	81	6000 hrs
700-Watt A-H12	35,000	50.0	(**)	
1000-Watt A-H12	55,000	55.0	71	6000 hrs
1000-Watt A-H15	52,000	52.0	75	6000 hrs
<b>FLUORESCENT MERCURY LAMPS</b>				
400-Watt J-H1	19,000	47.5	79	6000 hrs
700-Watt B-H18	33,000	47.2	(**)	
1000-Watt C-H12	50,000	50.0	73	6000 hrs
1000-Watt B-H15	49,000	49.0	74.5	6000 hrs
<b>MERCURY REFLECTOR LAMPS</b>				
400-Watt K-H1	17,000	42.5	(**)	6000 hrs
400-Watt L-H1	16,000	40.0	(**)	6000 hrs

\*Depreciation of lumen output is comprehended in the Maintenance Factor.

\*\*Not published.

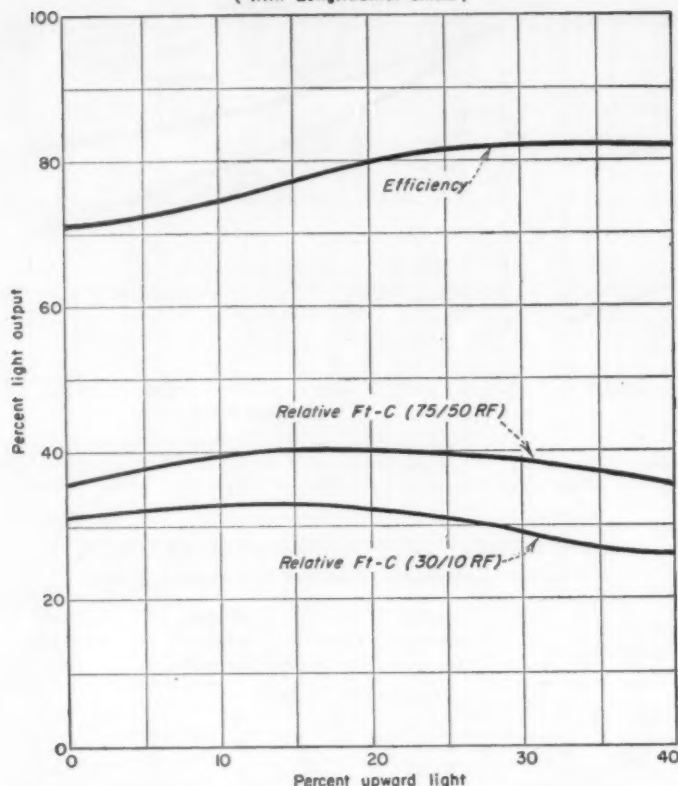
Data in this table compiled by J. Roy Jones, Regional Engineer, Westinghouse Lamp Division, Los Angeles, California.

The average light output for lamps throughout a period shorter than their rated average life is higher than it is for the full rated life. This is obvious since the light output is lowest at the end of life. Thus, when lamps are discarded (through group lamp replacement) prior to the end of their life, the average illumination level is automatically raised. Also, since the lamps are near the end of their life, they are about to fail anyway if they are of the fluorescent or filament types. Thus, it is cheaper to replace them in a group than to pay labor charges to replace them one at a time as they fail.

Mercury lamps, on the other hand, are not necessarily about to fail as they approach or pass their rated life. They may burn on and on, and give less and less light. However, they still continue to consume electricity and to occupy a socket where a good lamp should be. They too should be destroyed when they have burned their normal rated life, because they are no longer efficient. The rated average life of good quality mercury lamps is not based on the length of time that they will continue to burn, but on the length of their useful life.

The frequency of cleaning, and the point in lamp life at which the lamps should be replaced, depend on the particular installation—types of reflectors involved, the types of lamps in use, and other factors. A complete analysis of each lighting system is necessary in

**CHART III. TWO-LAMP FLUORESCENT LUMINAIRE**  
(With Longitudinal Shield)



**UPWARD COMPONENT** of light increases efficiency of fluorescent units.

order to determine the most economical maintenance program.

In the purchase of lighting equipment for new installations consideration of the future maintenance problems may save a considerable amount of money later—just as planned lighting is better and more economical than lighting that is installed without a thorough study of all the factors.

As has already been shown, reflector ventilation is important from the standpoint of maintenance. Of perhaps even greater importance is the fact that ventilated fluorescent luminaires operate at higher efficiency and direct some light upward, which is desirable. This is shown in Chart III. The higher efficiency is possible because less light is trapped in the reflector, and because

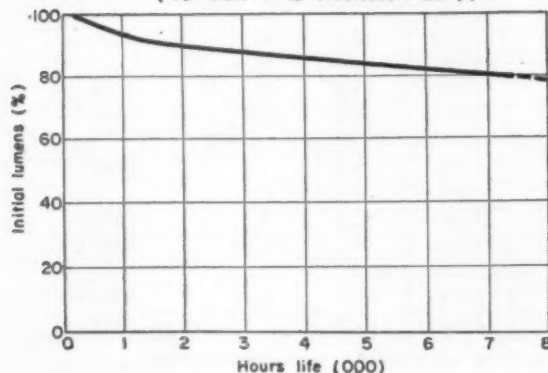
the lamp operating temperature is more favorable. Thus higher efficiency can mean more light at no increase in cost. The relative footcandle level with typical upward component luminaires for rooms having high reflectances (75% ceiling reflectance and 30% wall reflectance) and that for rooms having low reflectances (30% ceiling reflectance and 10% wall reflectance) are also shown in Chart III for a typical area. The upward component is desirable because it makes brightness ratios more nearly uniform and improves seeing comfort. Thus, ventilated fluorescent reflectors provide more light of better quality at no increase in cost, if the upward light is limited to approximately 20%.

In high bay areas where the atmosphere contains extreme quantities of dirt, smoke, or corrosive fumes, enclosed equipment is recommended. These reflectors maintain their light output slightly better than ventilated open reflectors when the air contains ordinary dirt.

Reflector lamps are a special type of enclosed equipment. They have a highly reflecting silver coating deposited on the inner surface of the bulb that is completely sealed from outside air. Since dirt does not adhere readily to the bottom surface of the bulb, these lamps maintain their light output better than other types of lighting equipment. However, since they are relatively small, and therefore extremely bright, they should be used only where they may be mounted high enough to be outside the normal line of sight of persons working in the area.

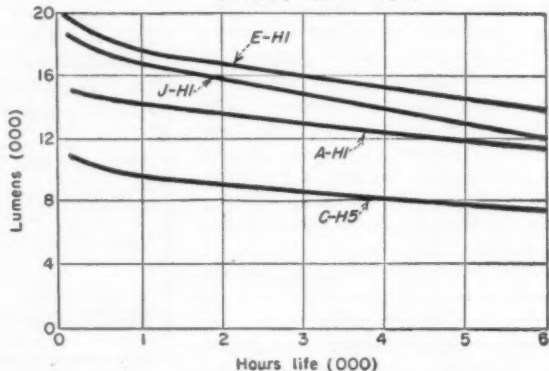
Both incandescent and mercury reflector lamps are available in either a wide or a narrow light distribution to fit a wide range of high bay industrial applications.

**CHART IV. LUMEN MAINTENANCE**  
(40-Watt T-12 Fluorescent Lamp)



**LIGHT OUTPUT** of standard fluorescent lamps drops to about 80% after 7500 hours operation.

**CHART V. AVERAGE LUMEN MAINTENANCE**  
(Mercury Vapor Lamps)



**MERCURY** vapor lamps depreciate at varying rates over average 6000 hours' life.



# A Spinner-Type De-Reeler for Magnet Wire

... cuts wire costs and speeds coil winding at The Louis Allis Company

By Walter Karow

Electrical Inspection Foreman  
The Louis Allis Company  
Milwaukee, Wisconsin

IMPROVEMENTS in manufacturing methods are due either directly or indirectly to a previous solution of a similar problem. Just as the introduction of the spinner reel to fishermen has solved the problem of backlash and line breakage, the application of this principle to magnet wire de-reeling has eliminated many disadvantages of previous wire pay-out methods in the coil winding department of The Louis Allis Company in Milwaukee. The development of a spinner-type de-reeling stand has reduced wire breakage, wire scrap, eliminated re-spooling and, in general, has increased the speed of the coil winding operation.

In the past, shaft-mounted wire spools rotated as the wire was being drawn off and required some sort of braking device to prevent spool over-travel when the winding head stopped. Improper adjustment of wire tension inevitably resulted in wire stretch and breakage. This was particularly true for long coil forms rotating at a constant speed where the demand for wire varied to a point where jerking occurred. Because proper braking and tension were difficult to control, this pay-out method was limited to eight-inch diameter spools. Since magnet wire was received on 12-inch reels, it had to be rewound on smaller spools before it could be used. Such re-spooling caused considerable damage to the

wire and resulted in "spool-end" scrap. It is estimated that re-spooling caused up to five times as much scrap as would have resulted from the use of the original 12-inch spool.

The new de-reeler, designed, constructed and used in the Louis Allis plant, features direct magnet wire pay-out from large stationary spools; requires no braking unit on the reels; permits operation of winding machines at top speeds; eliminates wire over-travel, stretch and breakage.

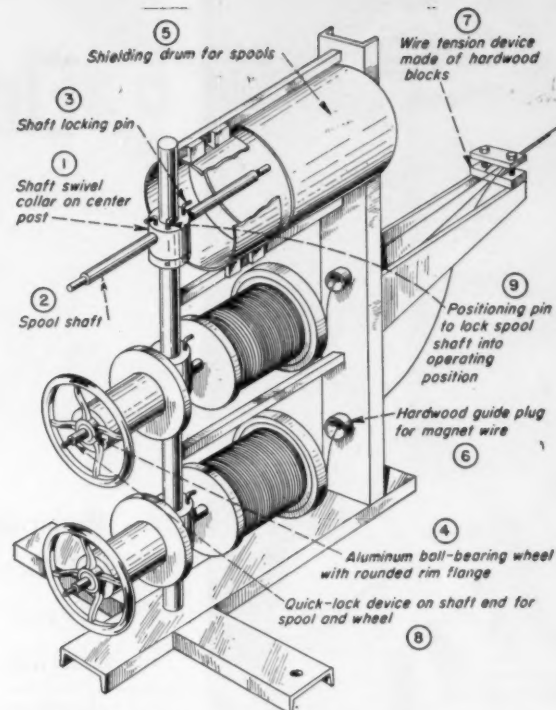
## Construction

Design and structural features of the free-standing de-reeler are illustrated in the attendant drawing. A heavy channel-iron front upright with bracket extension for the wire tension block and a round steel post at the back around which reel shafts can swivel for quick spool replacement.

The steel collars (1) swivel out when spools are being changed; support spool shafts (2) which are available to accommodate all standard size spools and can be interchanged by removing the locking pins (3). A ball-bearing aluminum wheel (4) with overlapping rim flange mounts on the reel shaft. This round, polished, wheel flange telescopes over one end of the reel; provides a smooth surface over which the magnet wire can swirl as it

is de-reeled. Should the wire catch on this rim, the wheel will turn and prevent insulation abrasion. A protective spool shell (5) is attached directly to the de-reeler frame. Another shell can be telescoped into it at the time of spool change. When wire is being drawn off, the movable shell is positioned over the spool thus restricting the wire to the small area around it. The wire guide (6) in the front upright is a hardwood block with a funnel-shape hole for smooth passage of the conductor. These blocks can be quickly removed and replaced at the first sign of wear. The tension device (7) consists of two half-round hardwood blocks under spring pressure. The block faces are lined with felt to prevent wire abrasion.

Loading the de-reeler is a simple operation. The wire spool is placed in the shaft and followed by the flanged wheel. Both are held securely in place by a quick-lock device (8) attached to the shaft end. The loaded shaft is then swung around to the front (facing the winding machine) and locked into position by placing a pin (9) in holes in the shaft and post collars. After the wire is threaded through the guide "plug", it passes through the tension blocks. After the shell has been moved into position, the tension blocks are adjusted and the wire is ready for de-reeling.



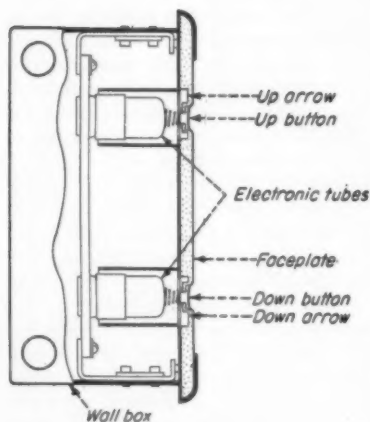
DESIGN DETAILS of spinner-type magnet wire de-reeling unit. Device uses stationary spools with swirling wire pay-out over smooth-flanged ball-bearing end-wheels.

# Electronic Touch Buttons

... for Elevator Landing Fixtures



**TOUCH BUTTONS** have no moving parts, no incandescent lamps, no magnetic relays; yet they register calls and light up for visual verification at the slightest touch by a prospective passenger.



**COMPONENTS** of an electronic touch button fixture include wall box, brackets, tubes, translucent arrows, opaque stationary buttons and streamlined faceplate.

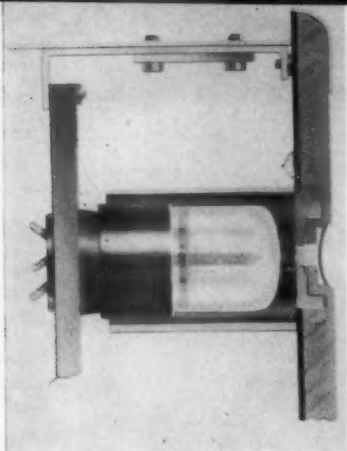
Modernization of older office or apartment buildings can be materially aided by renovating elevator lobbies through such mediums as new shaftway doors, new indicating lights and new electronic signalling devices that enable calls to be registered by the mere *touch* of a waiting passenger's finger. Here are some interesting facts concerning the operation, design, construction and wiring of these touch buttons.

**O**NE of the visible signs of a modern elevator installation is the presence of electronic touch buttons adjacent to elevator doorways. These attractive signalling devices have no moving parts, yet translucent arrows (green for Up and red for Down) are instantly illuminated when a waiting passenger touches a stationary opaque button set in the center of the arrow he wishes to activate. The lighted arrow tells the passenger that his call has been registered, and the arrow remains lighted until the call is answered.

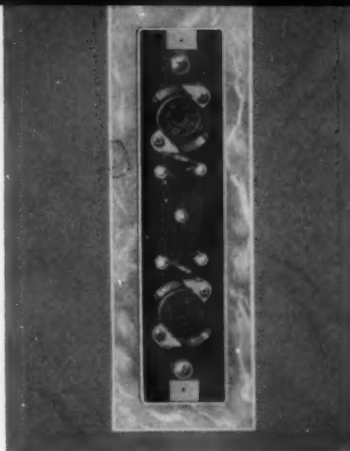
Since these touch buttons have no moving parts, they cannot be jammed with pins, toothpicks or chewing gum—a trick that was occasionally practiced formerly by impatient or prank-minded passengers waiting for service. Since there are no contacts, the problem of corrosion is eliminated. Since arrows are lighted only when the signalling circuit is closed, they provide a positive indication that a car is on the way. Since there are no incandescent lamps behind the translucent arrows, the chore of replacement is absent. Since there are no magnetic

relays (latching magnets), and no adjustments to be made, maintenance is simplified. And, in the absence of incandescent lamps, wiring associated with this touch button system is less than half that of a conventional "telltale" signalling installation.

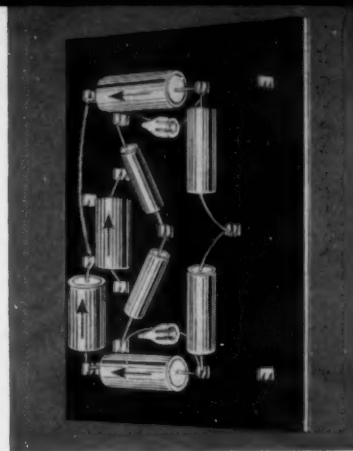
In construction, a touch button fixture consists of a wall box, a faceplate containing either one or two (depending upon whether the station is at a terminal or at an intermediate floor landing) translucent arrows and opaque touch buttons, an electronic tube located behind each arrow, and brackets for mounting the faceplate and tube receptacle base. It should be noted that the face of each touch button is covered with an insulating material having a high dielectric constant, although the *back* of each button is made from an electrically conductive material, thereby constituting one plate and the dielectric of a condenser. The top of each electronic tube is also coated with electrically conductive (translucent) material, and these two conductive surfaces (back of button and top of tube) are in contact through



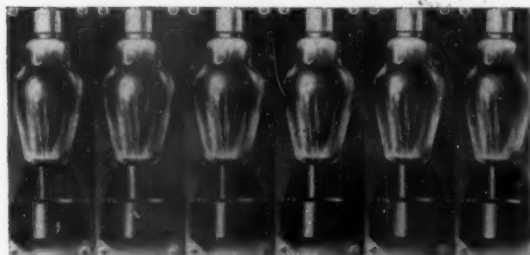
**ELECTRONIC TUBE** has transparent conductive coating, in contact with electrically conductive button base through a spring. Face of button is insulated.



**WALL BOX** of fixture with faceplate and electronic tubes removed shows simple construction, position of tube receptacles and wiring facilities.

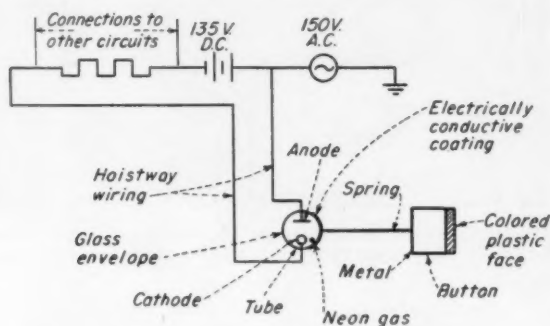


**PANEL** for intermediate-landing 2-button touch button fixture, containing loading resistances, neon lamps and dry plate rectifiers, measures less than 3-by-5-in.



**POWER SUPPLY** for 135-volt dc is provided by "power back" group of vacuum tube rectifiers, located in elevator machine room.

**WIRING DIAGRAM**, greatly simplified, shows relation of individual touch button and electronic tube to ac and dc power.



a spring. The tube itself is a cold-cathode unit, with neon gas surrounding the anode and cathode. As diagrammed by the Otis Elevator engineering department, these buttons are connected through hoistway wiring to 135-volt dc and 150-volt ac power sources.

It can be noted that the 135-volt potential exists constantly between the anode and cathode of each tube but, although this potential is sufficient to maintain a flow of current once it is started, it is not great enough to complete the circuit without a momentary boost from another source.

It will also be noted that a 150-volt ac potential exists at all times between the anode of the tube and ground and, when a prospective passenger places his finger on the button, the distribution of the electrostatic field inside the tube is changed sufficiently to obtain the needed boost to bridge the conducting circuit, thereby "igniting" the neon gas in the tube. This causes the tube to light up and illuminates the translucent arrow immediately in front of it.

Once the circuit has been closed, the illuminated arrow continues to glow,

giving positive proof that the signalling circuit is closed. The call remains registered until an elevator arrives at the station and the door is opened, at which time a momentary voltage pulsation reduces the potential across the tube to a value which is insufficient to maintain a flow of current. The tube then stops glowing, the arrow disappears, and the call is cancelled.

As to wiring, each shaftway riser has one wire common to all fixtures, and one additional wire for each button. Therefore, for a single elevator serving "N" floors, with up-and-down plates at all intermediate floors and a single-direction plate at upper and lower terminals, the number of wires in the riser would be  $2N$  minus 1. Since the electronic tubes (having long life expectancies) act as their own sources of light, the need for separate incandescent signal lamps is eliminated, and the number of wires required for the signalling riser is half that of a standard tell-tale installation.

Located in the elevator machine room is a group of "power pack" vacuum tube rectifiers—the power sup-

ply for furnishing the 135-volt dc potential necessary to maintain the flow of current through touch button tubes during intervals between call registrations and cancellations.

Also located in the machine room is one small (less than 5-by-3-inches) control panel for each electronic touch button fixture. Panels for a 2-button fixture contain 2 loading resistances (one for each touch button) that limit the current flowing in their corresponding circuits when calls are registered, 4 or 5 "dry plate" rectifiers, plus 2 small neon lamps (one per button) that light up when calls are registered and also facilitate maintenance and inspection routines. Panels for terminal fixtures (having a single touch button) contain only one resistance, one lamp and 2 or 3 rectifiers.

These touch button systems are long-lived, highly foolproof, have no moving parts, no latching magnets and minimum wiring. And they give visible proof to visitors and tenants alike that the building owners are up-to-the-minute in their approach to elevator signalling.



**MODERN LIGHTING** in remodeled show room of Georgia Power Company, Macon Division, Macon, Ga., sets local standard for display of lighting practice and highlights merchandise for easy inspection.

## Power Company Sets Modernization Pace

Rewires own office building for second time in quarter century to provide adequate power for air conditioning and better lighting.

**Main Switches For New Load Requirements**

Switch	Capacity	For Feeder Circuit To
A	100-amp	Passenger Elevator
B	200-amp	Air Conditioning—1st & 2nd Floors
C	100-amp	Air Conditioning in Assembly Room
D	30-amp	Water Heater
E	100-amp	Engineering Office, 2nd Floor—Panel E
F	200-amp	Assembly Room—Panel B
G	30-amp	Water Heater
H	100-amp	Offices, 1st Floor—Panel A
I	30-amp	Meter Room—Panel L
J	100-amp	Division Office, 2nd Floor—Panel D
K	60-amp	Window Lighting, 1st Floor
L	60-amp	Sidewalk Freight Elevator
M	60-amp	Storage Area and Basemen

**G**EOORGIA Power Company officials believe in the old adage—Practice What You Preach. They preach adequate wiring, and extoll its benefits to their customers year in and year out, for new and old buildings of all types.

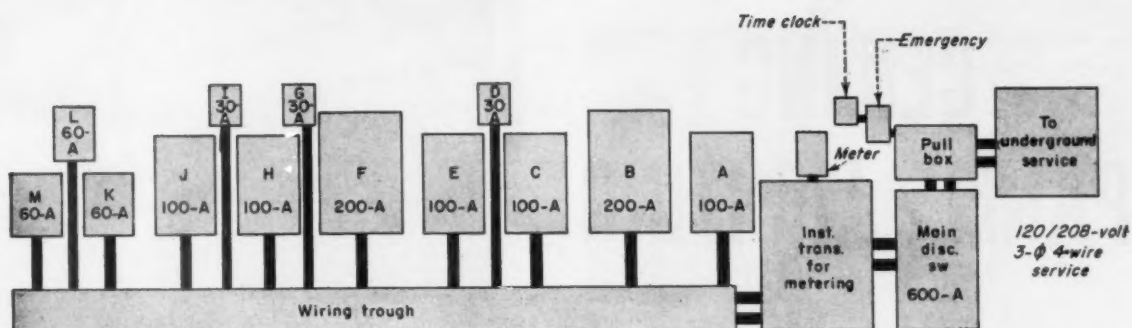
The branch office in Macon, Ga. has been housed in an old building which they moved into in 1925. Like other buildings of that era, it was wired for electrical adequacy as envisioned at that time.

In 1935, however, the original wiring proved to be inadequate for the electrical demands of the new indirect lighting which they installed in their salesroom and general and engineering offices. So a new 42 kw service, consisting of 4 No. 4/0 wires for a 3-phase 4-wire 208/120-volt system was installed, to supply power to the three distribution panels (See "Old Wiring

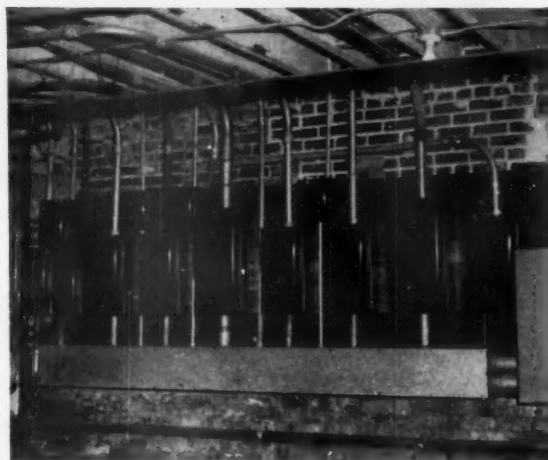


## NEW DISTRIBUTION FEEDER MAIN SWITCHES

## NEW SERVICE ENTRANCE



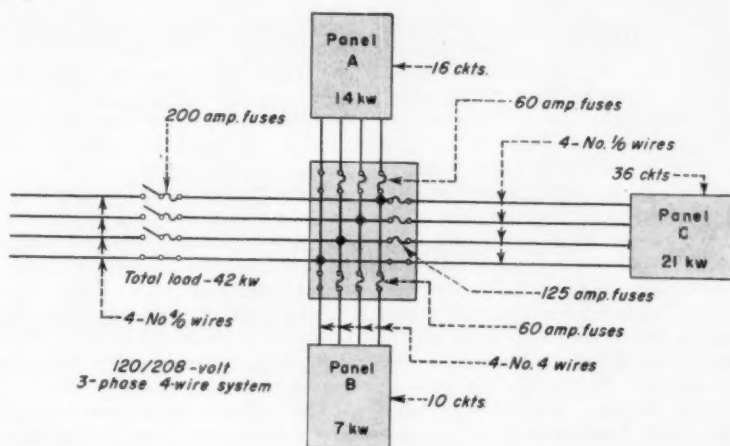
**ADEQUATE POWER** for new expanded electrical needs of the Macon Division headquarters building is available through new service entrance installation.



**NEW SERVICE** including feeder switches for light and power are installed on wall of basement floor used for garage storage.

System" drawing). This system served well for a few years, until the demand for air conditioning, electrical facilities for a new assembly room, and stepped-up lighting intensities in the postwar years again outgrew the 1935 service capacity.

In 1952, it was realized that the electrical system must be revamped again to meet these new demands brought on by a stepped up pace of electrical living. So modernization plans were drawn up for modernizing the entire building, including its electrical facilities. The revamped building now has the appearance of a new building, and the electrical system (See photo and sketch) is now adequate for all current and foreseeable demands. The new system serves as a model installation for the typical commercial customers served by the Georgia Power Company in the Macon Division.



## OLD FEEDER AND CONTROL SYSTEM

**OLD FEEDER** and control system installed in 1935 proved inadequate for modern postwar electrical needs in the office and salesroom building.

# Low Brightness CEILING PANEL LIGHTING

Large public area bank with low ceiling is lighted with 48-in by 96-in luminous panels installed in rows between beams, giving illusion of greater ceiling height and design harmony.

By Berlon C. Cooper



LOW CEILING in County Trust Company's Mt. Vernon,

**A**CAREFULLY planned and custom designed lighting system, using 4-ft by 8-ft low brightness luminous ceiling panels, was used to light the main banking area of County Trust Company's branch bank in Mt. Vernon, New York. Located on the first floor of the Garafano building, this bank is now lighted to an intensity of approximately 45 footcandles of well diffused and comfortable lighting, and presents a most pleasant and attractive atmosphere of quiet conservatism wholly in keeping with the dignity of the bank.

This area was formerly a bank, several years ago, with a 20-foot high ceiling. It was subsequently rented to a store, which converted the space into a merchandising area with a large balcony. It has now recently been converted back to a bank, and modernized in all respects. The original 20-foot ceiling height has been cut in half by the installation of a new floor, leaving a relatively low ceiling for such an expanse of area. A large heavy beam runs from front to back in the area, supported at two points by large columns, and small beams run in the same direction, supported by intermediate beams running at right angles to the main beam.

In working out a lighting design for this area, the architect decided the lighting should be such that it would help relieve the appearance of a low ceiling needed to conceal the beam structure. At the same time, he wanted the lighting to maintain a sense of dignified design; hence he eliminated the idea of a wall-to-wall luminous ceiling. He settled on a large 4-ft by 8-ft luminous panel, which could be worked into a ceiling pattern and miss the heavy beam structure. This permitted space to be made available for installing fluorescent lamp housings, ballasts, wireways and lamps in the cavity over each panel.

These large panels are of proper size to use a standard 4-lamp 4-ft wide by 8-ft long Smithcraft Area Illumination lamp and wireway housing, with standard hanger assemblies. These lamp housing channels were installed so that lamps would be located 8 inches above the plastic panels, with the lamps spaced 12 inches on centers.

The close spacing of lamps was made necessary because of the shallow depth of the plenum above the luminous panels. For this reason, 96-inch T-8 slimline lamps were selected for use, and operated at 120 ma current density rather than the usual 430 ma operation

of standard T-12 fluorescent lamps normally used in luminous ceilings. The initial lumen output for each luminous panel is therefore 9400 lumens, and total wattage, including watts loss in ballasts, is 170 watts. Initial lumens per watt were 55.3.

Diffusing panels were Plexiglas No. 2333-150 by  $\frac{1}{8}$ -in with C2 $\frac{1}{2}$  corrugations, in 48-inch square sections. Two sections are used per panel, using the overlap joint to conceal all lamps. A total of 51 units of the 4-ft by 8-ft size and two units of the 4-ft by 4-ft size were required.

Noise is controlled by acoustical tile, which is installed under the main and sub-beams, and forms the grid pattern design for the luminous panel layout. About half of the ceiling area is luminous, half tile.

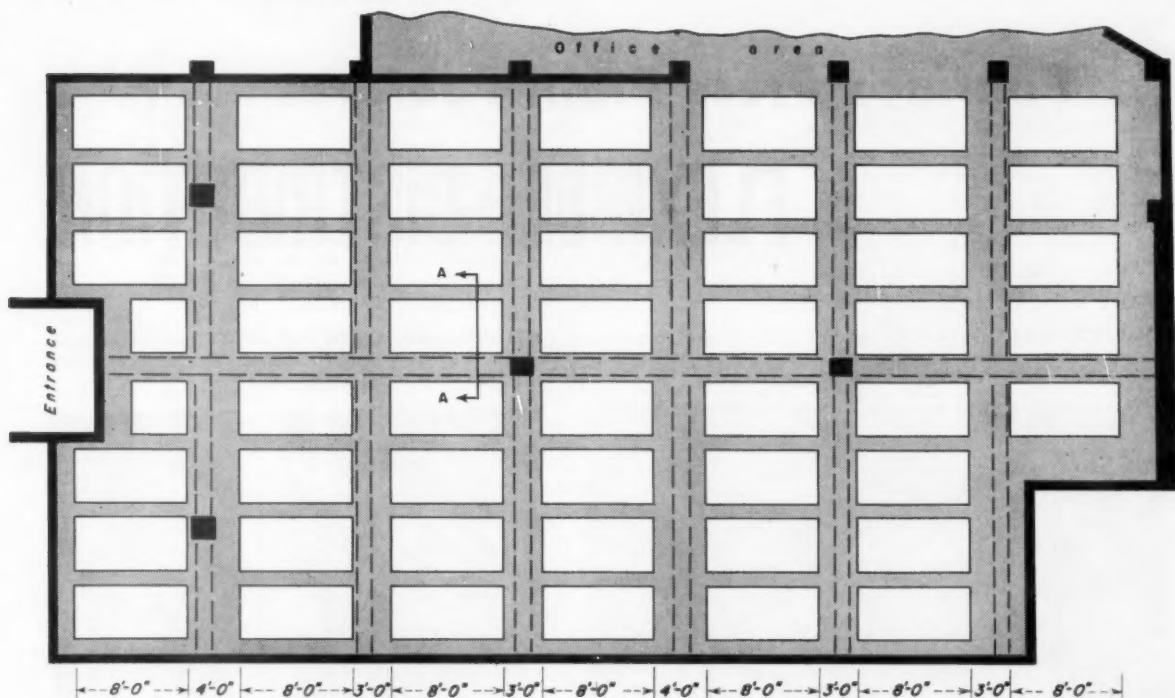
Architect for this project was Theodore Richards of White Plains, N. Y., who selected the lighting system and integrated the luminous panel design into the interior architectural treatment of the area. Whiffen Electric Co. of White Plains were the electrical contractors who made the installation and did all the electrical work. The contractor purchased the Smithcraft lighting equipment through General Electric Supply Co. of Yonkers, N. Y.



N. Y. branch bank dictated custom lighting layout.

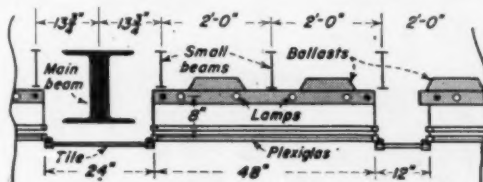


**LAMPS** are F96T8 slimline operated at 120 ma, spaced on 12-inch centers, 8 inches above 2½-inch corrugated Plexiglas panels, held in lamp holder housings with ballasts mounted on top of housing. Small rod at each end of lamp holder housing is a spacer. Efficiency of system could be improved by painting entire cavity flat white.



**CEILING PLAN** for banking area shows layout of 4-ft by 8-ft panels and location of beams. Section A-A gives location details for lamps, housings, ballasts, etc. above Plexiglas panels. Lamps are operated at low current density to keep panel brightness low, so they will be in keeping with the bank's quiet dignity.

SECTION A-A





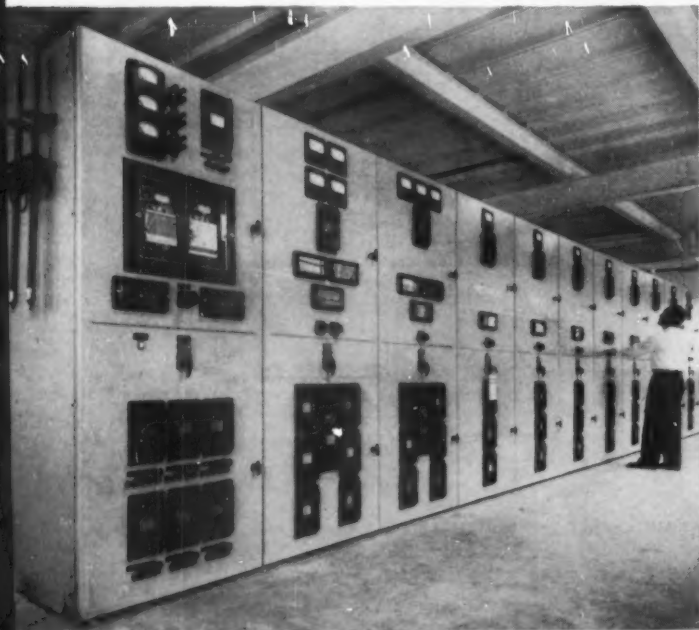
**SIXTY FOOTCANDLES** is delivered to the working level 40 feet below by 1000-watt A-H12 mercury vapor lamps. Low power cost is only 3.3 watts per sq ft.

## ***Pontiac's Press Plant Features . . . .***

# **FLEXIBLE DISTRIBUTION**

**COMPACT MAIN SUBSTATION** includes (left to right) metering equipment, main breakers for the two incoming 5-kv lines and a common bus feeding the 13 distribution breakers.

**WELDING AND POWER BUS DUCTS** are run between double columns which divide bays. This provides clearance for traveling overhead crane.







**DUAL LIGHTING SYSTEM CONTROLS** automatically switch to standby incandescent system, hold standby lights on during mercury lamp preheat cycle.

By C. E. Webb and B. E. Brown\*

## and DUAL LIGHTING

**L**IKE so many plants built during the past few years, the big (440,000 sq ft) new press shop for the Pontiac Motor Division of the General Motors Corporation was designed for dual use. At present, it is housing facilities for the manufacture of defense products, but its normal peacetime function will be as an automobile press plant. In this sort of arrangement, flexibility is placed at a premium. Naturally, this theme was carried over into the design of the distribution system.

The designers, Albert Kahn Associates and Pontiac Plant Engineers,

felt that the best way to get maximum flexibility was to use a combination of bus duct, panelboards, and underfloor raceways. Immediately there was a problem of construction rather than system design. Because the area was to be used as a press shop, it was necessary to provide 100-foot cranes, which in turn necessitated high bay structures. Bus duct runs could be placed only where the use of the cranes would not be hampered. Since every bay was a high bay, the bus duct runs had to be placed in between the double columns supporting the crane girders on either side of the bays. This was done by using the smallest and narrowest square-cross-section duct available. Because of a considerable welding load, separate feeder runs were set up for welding apart from power feeders. The power bus duct is 2000-amp, 3-phase, 3-wire, 480-volt ventilated and

the welding duct is 1600-amp, 3-phase, 3-wire, 480-volt ventilated. To insure ability to withstand high fault currents, all bus duct insulators are made of treated maple block with laminated plastic insulating sleeves rather than the usual porcelain.

Service to the new building comes from either of two Pontiac substations—the Montcalm at 5-kv or the new Columbia—through a 10,000-kva transformer (41.6Y/5 kv). Two incoming 5-kv feeders serve the switchgear, each connected to a main breaker, the load sides of which serve the common main bus for the 13 branch breakers.

Power for the plant is delivered from four 1500-kva, 5-kv to 480-volt unit substations and the lighting is served from separate unit substations located on the roof. The unit substation transformers are type ASL, air-cooled. They are totally enclosed and ventilated. Welding bus duct runs are fed from three 1000-kva, 5-kv to 480-volt substations. Provisions have been made to redistribute the load and/or add a fourth welding substation if necessary.

Fault currents approaching 50,000 rms amperes are possible in this system at points far removed from the power centers. This calls for special capacity on the circuit breakers which connect the distribution panelboards to the power and welding bus duct runs. Each has an interrupting capacity of 50,000 rms amperes and a full load capacity of 1200 amps. These circuit breakers are located directly below the bus duct at every other bay, alternately power and welding. Splice points are so arranged that one side of a column has a precisely located power splice and the other side a welding splice. Conduit from the breakers is run down directly to the distribution panelboards.

The panelboards are of the fully convertible distribution design, using air circuit breakers with a minimum of 15,000-amp interrupting capacity. Main bus capacity is 1000 or 1200 amps, as required. All panelboard interiors and tubs are of maximum size available, to allow for any possible future concentration of loads. Although all panelboards were manufactured for existing machine tool loads, unused space for one 600-amp, 3-pole breaker plus a number of 100-amp, 3-pole breakers is provided. A maximum of 28 100-amp, 3-pole, circuits can be accommodated. The panelboard design is such that any circuit breaker, whether it be of the 100-, 225-, or 600-

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B. E. Brown is Assistant Plant Engineer of the Pontiac Motor Division of General Motors Corporation, Pontiac, Michigan.



**MERCURY LAMP TRANSFORMERS** are mounted in pairs on the roof trusses. Conduits are supported by upright brackets mounted on trusses.

frame size, can be added at a later date without making alterations to the panelboards. All such changes can be accomplished with only a screwdriver, working from the floor.

#### **Underfloor System**

The underfloor distribution to serve the equipment in the 100-ft wide crane bays is rather unique. It was decided that it would be better to try an under-floor system of conduits to machines rather than running them overhead. This underfloor system consists of non-metallic conduits installed below the floor slab. They run from the power panelboards to flush hand-holes located on approximately 25-ft centers across the bays. Conduit extensions from the hand holes to the equipment are run in the wood block floor and are covered with a cast iron channel which is the same thickness as the floor blocks.

The welding panelboards, which will assume maximum loads under normal press shop operation, differ only in that all circuit breakers are of the interchangeable trip design. This design utilizes magnetic trip elements only, to eliminate the unnecessary tripping caused by the progressive inching of bimetallic elements caused by high duty cycle welding circuits.

The lighting for the new press shop represents what is most likely the

world's largest installation of 1000-watt mercury lamps. A total of 1290 A-H12 mercury vapor lamps maintain an average of 60 footcandles, with excellent power economy—only 3.3 watts per sq ft.

Aluminum high bay reflectors house the lamps at a mounting height of 43½ feet and at 20 ft by 16 ft 8 in spacing. The reflectors provide an IES medium distribution of light and shield the lamps through a 32-degree zone.

Power for the mercury lighting is supplied at 120 volts through a 3-phase, 4-wire system. It is serviced from four 500-kva, 480- to 120/208-volt power centers located in the pent houses. Conduit and cable feeders extend to control located on balconies.

The lights are switched by means of remote control pushbuttons, accessible from the floor, which actuate 3-pole contactors located in the distribution centers. These contactors energize 3-phase, 4-wire branch circuits to the mercury ballasts. Each circuit serves nine mercury lights. The ballasts are of the single-lamp, auto-transformer type, mounted on the roof trusses.

#### **Automatic Lighting Controls**

Emergency and night light is provided by 317, 1000-watt incandescent lamps. These lights are served by a separate source, from the 480-volt,

3-phase system through dry type transformers fed from adjacent power panels.

A unique arrangement of controls automatically turns on the night or standby lighting in case of failure in the mercury lighting feeders, and automatically turns off the standby lighting when the mercury lamps have restarted and come up to full brightness.

Upon full failure of the normal 120/208-volt source, or of partial failure of sufficient duration to extinguish the mercury lamps, the magnetically-held contactors which feed the mercury lighting sections drop out.

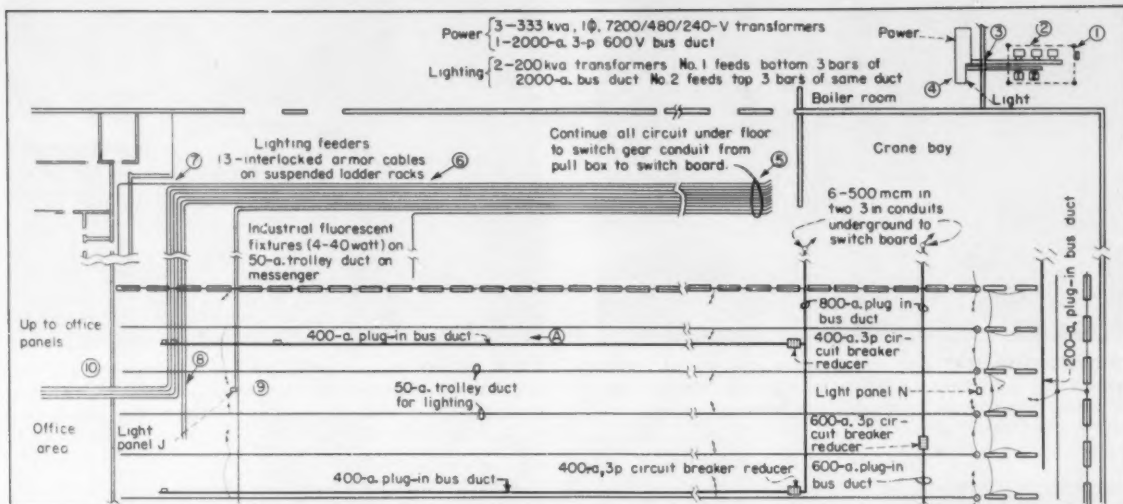
A normally closed auxiliary contact on these mercury contactors completes the holding-coil circuit for the incandescent contactors, which close immediately, lighting the incandescent night lights.

Upon restoration of normal 120/208-volt service (or when the mercury lights are switched on) the mercury contactor closes to begin the mercury lamp preheat cycle. At this same time, the normally closed contact in the incandescent holding-coil circuit opens. Simultaneously, however, power is applied to a circuit-opening timing relay. This immediately closes its contacts maintaining voltage across the incandescent holding coil. After approximately 15 minutes, to allow the mercury lamps to attain full lumen output, the timing relay opens its contacts, opening the incandescent contactor and thereby cutting the incandescent lamps.

Manual control for the lighting is provided for each 3-bay area by a five-position pushbutton station located on the columns. These stations incorporate:

1. A maintained contact "ON-OFF" position for mercury lights.
2. A blue indicating lamp connected across the mercury contactor holding coil to indicate when power is applied to the mercury lamps.
3. A normally-open cylinder-lock pushbutton to test the incandescent lamps without going through the sequencing operation.
4. A normally-closed cylinder-lock pushbutton to shut the incandescent lamps off over weekend or during shut-down periods.

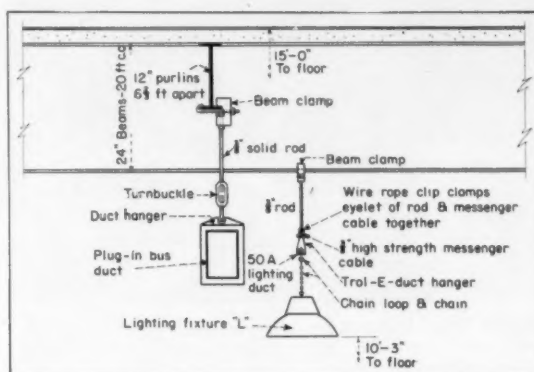
The manual incandescent controls are of the locking type to insure that they will not inadvertently be left burning by non-electrical workmen. Their 1000-hour life compared to the 5000-hour mercury lamp life makes it imperative that relamping of these incandescents be held to a minimum in order to utilize the full economies of the mercury lamps.



**COMPOSITE PLAN** of power and lighting system involving five methods of electrical distribution. Circled numbers and arrows identify photographs showing equipment and circuit supporting methods.

## Use of Five Distribution Methods In One Plant

..... assures electrical system flexibility at Standard-Thompson Corporation near Dayton, Ohio. Wiring installed by Chapel Electric Company required diverse mounting methods.



**MOUNTING DETAILS** of power bus duct and lighting trolley duct from rod supports and messenger cable. Note use of beam clamps and turnbuckle to level duct. Fixtures are chain suspended 10-ft., 3-in. above floor level. (Fig. A in diagram)

**F**IVE different secondary distribution methods, each with its own mounting features, supply the lighting and power requirements of the new Standard-Thompson Corporation plant near Dayton, Ohio. The modern facilities designed by Lorenze & Williams, Dayton architects, comprise a one-story manufacturing area of approximately 105,000 square feet with a two-story 50-ft. by 170-ft. office section in front. The complete electrical layout, made by Schweiger, Heap & Associates, consulting engineers, and installed by Chapel Electric Company

of Dayton, includes the following distribution methods:

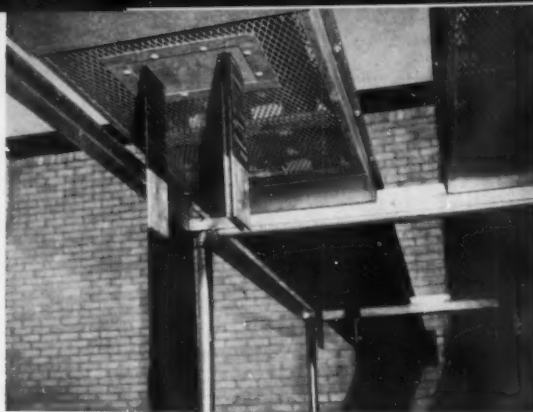
1. Conduit and cable—underground and overhead.
2. Interlocked armor cable for lighting feeders.
3. Trolley duct for lighting branch circuits.
4. Bus duct, plug-in and feeder types, for power circuits.
5. Cellular floor distribution for low and high tension circuits in the office section.

Primary service to the plant originates at a utility pole at the property

line. Two 4½-inch fiber conduits in a 3-inch concrete envelope carry these circuits underground for about 250 feet to an outdoor, concrete transformer mat behind the boiler room. Here, two sets of transformers provide the utilization voltages. One bank of three 333-kva, 7,200/480/240, single-phase units serve the 440-volt, 3-phase power system. A 2,000-ampere, 600-volt, 3-pole, low-reactance feeder bus duct connects these transformers to a 2,000-ampere main circuit breaker in the power section of the switchboard located in the boiler room. A second



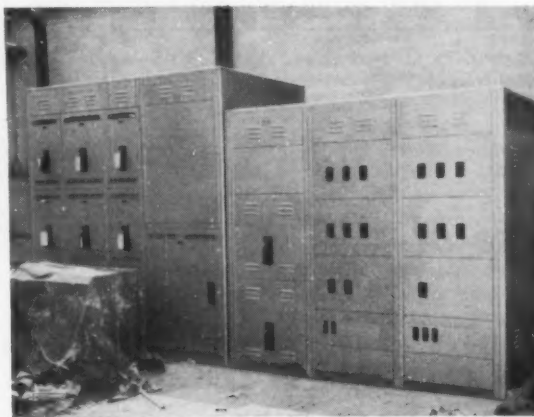
**TRANSFORMER MAT** pipe rack supports dual run of 2,000-ampere bus duct. Duct on left is for lighting, that on right for power. Underground primary ducts terminate in concrete curb in foreground. (Photo 1)



**RACK DETAIL** showing angle-iron frame on pipe supports and duct bus bar extensions for transformer secondary connections. Arrangement of these ducts with respect to the overall rack is shown in photo at left. (Photo 2)



**METAL SPLIT COLLAR** plates cover openings in boiler room wall where dual ducts pass through to back of main switchboard. (Photo 3)



**MAIN SWITCHBOARD** in boiler room has power section at left fed by 2,000-ampere main breaker; lighting section at right fed by two 1,000-ampere breakers. (Photo 4)



**UNDERGROUND CONDUIT** lighting feeders from switchboard terminate in this pull-box where they are connected to 13 interlocked armor 3-conductor cables, each feeding one panelboard. (Photo 5)

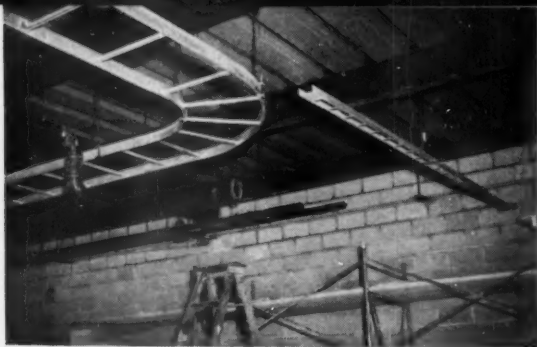


**TWIN LADDER RACKS** for interlocked armor cables start at feeder pull-box and continue through plant. Width of rack decreases as cables drop off to individual panels. (Photo 6)



**DROP-OFF POINT** at column with lighting panel permits decrease in ladder width from 20 inches to 12 inches. Rack turns right to carry remaining cables into office section. (Photo 8)





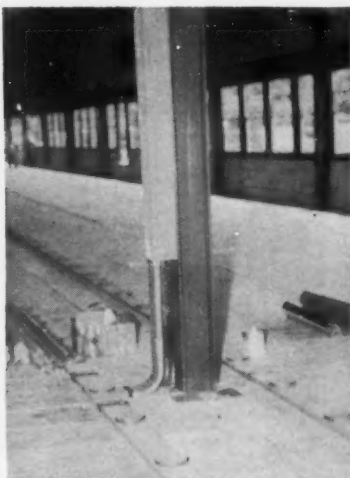
**RACK TURNS** at end of parallel run to carry cables to panels on opposite side of plant and in office area. Note beam-clamp rod suspension. Trough at right is for single cable. (Photo 7)



**REDUCTION SECTION** of lightweight rack is easy to assemble. Here, job superintendent John Doan holds rack which tapers from 12-inch to 3-inch width for single cable.



**NARROW COLUMN-TYPE** lighting panels are typical of those installed throughout the plant. Top half of panel (uncovered) is wire trough with branch conduit box above. (Photo 9)



**CELLULAR STEEL FLOOR** in office section is used for low and high tension wiring. Header duct from column panel at left is for convenience outlets; that at right for power outlets. (Photo 10)

bank of two 200-kva lighting transformers ties in with the lighting section of the switchboard through another 2,000-ampere bus duct run. One unit, connected to the lower three bars of the duct, feeds one 1,000-ampere lighting circuit breaker. The second lighting transformer connects to the upper three bus bars of the same duct and feeds a second 1,000-ampere main breaker in the lighting board.

Each main lighting breaker serves ten feeder breakers, mostly 100-amp and 200-amp ratings. Each feeder breaker serves one lighting distribution panel. Feeders to the 19 panels throughout the plant (ranging from 20 to 42 circuit capacity) are alternately connected to the two main buses—even numbered feeders to main breaker No. 2 and odd numbered feeders to main breaker No. 1. Thus panels serving adjacent areas throughout the plant are connected to different main breakers and lighting transformers. Should either of the dual lighting

service facilities fail, one half of the plant will still have light. Should any one feeder fail, only one panel will be affected.

Maintenance ease and quick replacement (if necessary) of individual lighting feeders are assured by using three-conductor, interlocked armor cable on 13 of the 19 feeders. These range in size from No. 2/0 to 500-MCM; are installed on twin, horizontal, ladder racks (one 20-in. wide, one 12-in. wide) which progressively reduce in width as cables drop off to individual panels.

One unusual installation problem was encountered on the lighting feeders. A low crane-bay between the boiler room and manufacturing area precluded overhead continuance to the switchboard. So the interlocked armor cables were terminated in a vertical pull and splice box at rack level supported by 13 conduits near the crane bay. Transition to conventional conductors was made at this point and the

conduits carried the feeders underground to the lighting switchboard.

Most of the lighting distribution panels are of the narrow column-type. Those in the manufacturing area serve continuous rows of messenger-supported, 50-ampere trolley duct from which fluorescent industrial fixtures are suspended. In the shipping areas, they serve stationary outlets with incandescent fixtures. Lighting in the office section is provided by continuous rows of louvered fluorescent troffers in a suspended ceiling. Circuits for the 115-volt convenience outlets in these areas are carried in the cellular steel flooring with individual cells fed by header duct from the lighting panels.

The power section of the main switchboard has 10 feeder breakers (including space for three spare units). Two 800-ampere units serve lateral runs of 800-ampere bus duct which, in turn, feed parallel rows of 600-, 400- and 200-ampere, 3-phase, 440-volt plug-in duct throughout the manufacturing area. A third, 400-ampere breaker serves a run of 400-ampere bus duct in a plating department. Other breakers serve power panel feeders. As in the case of lighting, feeder duct circuits had to be carried underground in conduit and cable to by-pass the crane bay near the switchboard.





Full advantage was taken of the cellular steel flooring for power circuits in the engineering department and kitchen areas of the office section. Distribution panels are fed from bus duct runs in the plant. Branch circuits (440-volt, 3-phase) are carried in header ducts to individual floor cells to provide unusual flexibility.

To install this complete electrical system, Chapel Electric Company encountered a number of different equipment support problems. To provide a clear picture of the methods and techniques involved, the sequence photographs are presented. Numbers on the plan drawing identify each photo and indicate camera angle.

# Data Sheet

## Conduit Rewiring Capacity Using TW Wire & 50% Occupancy

Based on Tables No. 1, 11 and 13 of the National Electrical Code

										
Cond. Size	Max. Size Wire	1Ø-3w. kw	3Ø-3w. kw	Max. Size Wire	3Ø-4w. kw	Max. Size Wire	1Ø-3w. kw	3Ø-3w. kw	Max. Size Wire	3Ø-4w. kw
1/2"	#8	8.6	13.0	#10	9.7	#10	10.4	15.6	#12	10.4
3/4"	#6	11.9	17.8	#8	13.0	#8	13.8	20.7	#10	15.6
1"	#4	15.1	22.7	#6	17.8	#8	13.8	20.7	#8	20.7
1 1/4"	#1/0	27.0	40.5	#2	30.8	#4	24.2	36.3	#6	28.5
1 1/2"	#3/0	35.6	53.5	#1/0	40.5	#2	32.8	49.3	#4	36.3
2"	300M	51.8	77.8	#4/0	63.2	#2/0	50.1	75.2	#1	57.0
2 1/2"	400M	60.5	90.7	300M	77.8	#4/0	67.4	101.1	#2/0	75.2
3"	750M	86.4	129.7	500M	103.8	300M	82.9	124.6	#4/0	101.1
3 1/2"	1000M	98.3	147.5	750M	129.7	400M	95.9	145.2	300M	124.6
4"				1000M	147.5	600M	122.8	184.1	400M	145.2
4 1/2"						800M	141.7	212.4	500M	166.0
5"						1000M	157.2	236.0	750M	207.5
6"									1000M	236.0

\* Current-carrying capacities are rated at 80% of those shown in Table 1.  
(chap. 10, N.E.C.) per notes 4 and 5 to Table 1

**IMPORTANT:**— All calculations based on 90% power factor.  
— Mechanical factors may not permit 50% occupancy.



AND EVERY HYLUG SIZE BETWEEN  
WITH TOOLS AND DIES FOR ANY SIZE



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# Kennecott's new adequate

## *and what it means to the Electrical Contractor!*

Few things are more important to Mr. and Mrs. Homeowner than the way their home is *powered*. He and she depend, as never before, upon a whole houseful of appliances. These electrical servants, in turn, must be fed plenty of power to operate smoothly at their full, built-in strength.

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Why don't all these homeowners rewire? You know why! The average person doesn't even recognize the symptoms of weak wiring in his home, or know what to do about them!

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People just have to be *told* about adequate wiring. They must be *sold* on it. *And that's just what Kennecott's national adequate wiring campaign is doing for you!*

It's a campaign of more than 121,040,000 hard-hitting messages now appearing in the pages of the Saturday Evening Post and This Week magazines. It's telling your prospects, your customers, the facts of electrical life and how to live it best. *What's more, every single advertisement sells your services . . . tells people to "call in an electrical contractor"!*

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This is an industry-wide promotion. Let's work together for its success. Ask about reprints for mailings, poster-size blow-ups for display and newspaper mats for your local campaigns. Address letter to Kennecott Copper Corporation, 161 East 42nd Street, New York 17, N. Y.

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**COPPER CORPORATION**

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Cable that is to be buried directly in the ground should be bought for one reason. That reason is to do the job. If cable is bought for price, for friendship sake, or for any other reason, it is a gamble. There is no place for luck in underground cable purchase.

The cable being buried in this picture is jacketed with neoprene and insulated with Anhydrex. It will get soaked every time it rains or snows. But it won't fail, as so many cables do, from water absorption. Why? Because no cable insulated with Anhydrex has ever failed from water absorption.

Anhydrex-insulated cables withstand wet weather and waterlogged ducts for long periods of time. That means exceptionally long life because of exceptionally stable electrical and physical properties possessed by Anhydrex. The specially-compounded neoprene jackets are resistant to oil, sunlight, flame, acids, and alkalis.

For these reasons, Simplex-ANHYDREX insulated cables, Type USE, are ideal for direct burial in the ground. The only protection needed is a thin bed of sand, and a board laid over the cables so that rocks and sharp instruments will not damage them. Catalog 1013 has more details. Write for it today.

# *Simplex* - ANHYDREX

## Insulated TYPE "USE"

**SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.**

# Practical Methods



**RADIANT HEATING PANELS** on the ceiling of this motel bedroom are electrically conductive rubber; require no maintenance and provide year round heating.

## Ceiling Panels for Motel Heating

### HEATING

Electrically conductive rubber ceiling panels are today providing year-round heat for the 42 units in the new Belvedere Motel on U. S. 81 North, San Antonio, Texas. These panels, Uskon heating panels made by the United States Rubber Co., are paper-thin sheets of specially compounded rubber that conducts current, sandwiched between sheets of aluminum foil and plastic.

These panels are being used at the motel because they are a clean source of heat. Another advantage of the panels which was particularly desirable is that they occupy no floor space in the rooms, requiring no radiators, pipes or ducts. The panels are out of the reach of children and are completely safe. The cost of installing the panels was less than that of a central heating system.

The heating panels are used in the three rooms of each unit and have been painted over to blend into the color scheme. The rooms are also equipped with air conditioning units and exhaust fans. In all, about 300 panels are in use in the units, the manager's office and the housekeeper's quarters.

The panels are glued to the ceiling with a special adhesive and operate on

230-volt circuits. They are individually controlled by thermostats in each room. When in use, the entire surface of the panel heats up evenly and quickly. Adequate heat is possible in 20 minutes. The panels are rated at 22 watts (75 Btu's), require no maintenance and should last as long as the building.

## Steel Tool Box Also Provides Parts Storage

### CONSTRUCTION

Methods of storing tools and miscellaneous groups of small materials and parts varies considerably on electrical construction projects. Each contractor has his own ideas based on field experience. Generally speaking, mobility, durability, flexibility and safety are prime factors considered in designing such storage facilities. The trend is toward sturdy boxes of metal or wood, mounted on easy-rolling casters, featuring easy access to all tools and equipment. Many of the units incorporate interior partitions to hold small items.

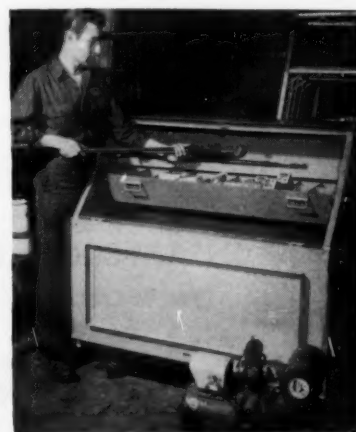
Howard Electric Company, Detroit electrical contracting firm, designs and builds its own tool storage boxes to fit its specific requirements. Development of such equipment is progressive, with new ideas being added as the box goes from project to project. Supervisors

and mechanics offer suggestions and changes. The net result is a storage facility which approaches the ultimate in meeting the needs of the average electrical construction job.

Latest of the Howard designs is an all-metal box sturdily constructed of sheet-steel on an angle-iron frame. The unit is 48 inches long, 27 inches deep at the base; and 42 inches high at the top where the box depth is only 10 inches. A slanting drop-lid, hinged to the front of the box about 30 inches above the floor, provides oblique access for easy removal of tools and equipment. The unit rolls on four 5-inch diameter, heavy industrial casters.

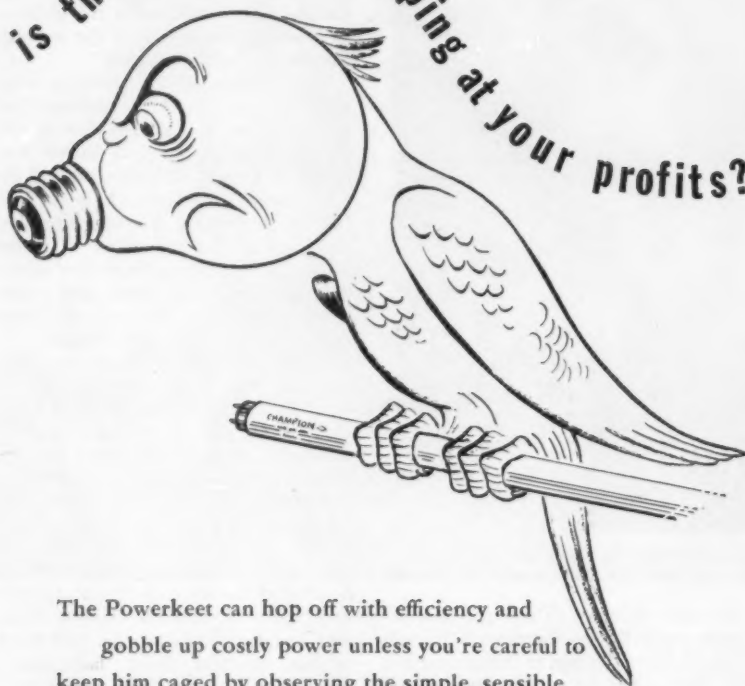
The box interior is divided into three sections. The large open area at the base (48-in. by 27-in. by 30-in.) accommodates pipe threading heads, electric drills, bulky tools, cartons of wire, cartons of outlet boxes and other equipment. Spanning this area, and riding on two angle-iron "rails" welded to the inside of the box, is a steel pull-out tray. This is partitioned into a number of 6-inch deep "bins" to hold such items as conduit fittings, fuses, tape, locknuts, bushings, etc. When not in use, the tray slides back like a drawer under a permanent steel shelf with a front flange. Large pipe wrenches, hammers, hickies and other tools are found on this shelf.

Most recent addition to this type of tool box is the transformation of the permanent interior shelf into a two-



**STEEL TOOL BOX** on casters is being "loaded" with tools and material in the Howard Electric Company shop for shipment to construction project. One-kilo-watt, 115-volt, gasoline generator in foreground goes along for power tools when temporary power is not available.

is the POWERKEET nipping at your profits?



The Powerkeet can hop off with efficiency and gobble up costly power unless you're careful to keep him caged by observing the simple, sensible practices outlined in the *Champion Maintenance Manual*\* and by maintaining a plentiful supply of efficient, dependable, long-lasting CHAMPION Lamps.

*\*Let us mail you a complimentary copy.*



## CHAMPION LAMP WORKS

594 Broad Street, Lynn, Massachusetts



**PULL-OUT TRAY** spans box; holds small material items in 6-in. deep bins; slides back under permanent shelf to provide access to base of tool box where power tools, wire and heavier material items are kept. Flanged drop-lid covers oblique access and is locked with padlock.



**TWO-SECTION CABINET** with sliding doors is added to permanent shelf in one of the boxes so twist drills, punches, dies and other expensive items can be kept under lock and key while rest of box remains open. This is a field idea incorporated into the box design.

section cabinet with two sets of sliding steel doors which can be locked in closed position. Expensive twist drills, punches and dies, wire connectors and other items which seem to "walk off the jobs" are kept under lock and key in this section. Only authorized personnel have access.

Howard engineers are fairly confident that they now have a tool box that gives them the durability, mobility, flexibility and safety they want. Chances are, however, that more changes will be made in the future. For management is always open to suggestions and new ideas and shows a willingness to try anything that appears workable.

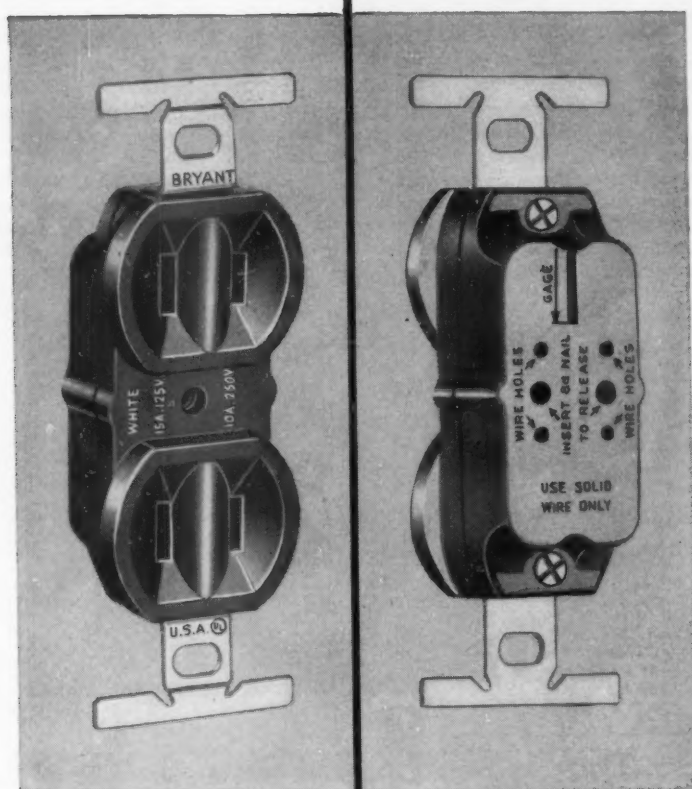
Howard electricians like this practical method of storing tools and equipment since it affords quick and easy access to the required item.



# NEW

## BRYANT OUTLET...

### Priced for the Residential Market



No. 6142

REAR VIEW

- Easy screwless wiring
- 8-penny nail releases wires
- Spring-grip terminals
- Double-sided contacts
- 15 Amps. 125 Volts — 10 Amps. 250 Volts

Bryant announces a new, quality spring-grip terminal duplex outlet priced for the residential market. The 6142 incorporates an all-plastic safety construction with live parts fully enclosed. Secure electrical contact is assured by double-sided phosphor bronze contacts. Its straight-through yoke has scored plaster ears. Takes solid wire, No. 12 or 14. Handy wire strip gage in base. Washer-held mounting screws for quick installation.

One simple operation to wire—just insert stripped wire in hole—that's all there is to it. Inserting an 8-penny nail in center hole releases wire.

The No. 6142, available in brown and ivory, fits all standard switch boxes and duplex outlet plates.

*Specify Bryant from your Electrical Distributor.*

*Listed by Underwriters Laboratories, Inc.*



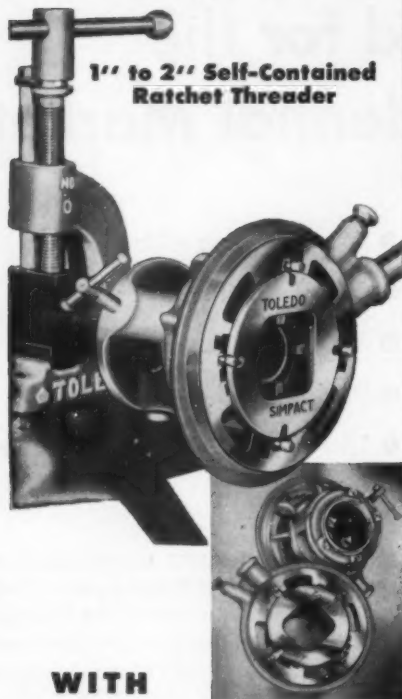
## THE BRYANT ELECTRIC COMPANY

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# NEW Improved TOLEDO Simpact



## WITH CAM-TYPE PIPE HOLDER

- ★ Improved cam-type quick-action pipe holder has broader jaws for more positive grip on pipe.
- ★ Free action cam assures instant setting to any size—1" to 2".
- ★ Easy to center... you get perfect aligned threads.
- ★ Fewer moving parts... minimum wear... light in weight. Amazingly compact... will thread a pipe projecting through a wall as short as 6 1/4".
- ★ Accuracy proven through the years... dies recede along tapered steps. A fine quality tool—yet low in cost! Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER!

# TOLEDO

PIPE TOOLS...POWER PIPE MACHINES...POWER DRIVES



## Practical Design For Service Pull Box

### FIELD CONSTRUCTION

Due to the installation of a new higher-capacity substation for recently-expanded Mercy Hospital, Sacramento, California, it was necessary to provide larger primary feeders. These feeders were extended from a near-by utility pole line, dropped underground in rigid conduit at the base of the nearest pole, and terminating inside the new hospital vault.

This underground service is provided with an amply-dimensioned pull box at each right-angle change in feeder direction, the box being of reinforced concrete and the cover consisting of a flat steel plate, secured as indicated in the accompanying detailed sketch.

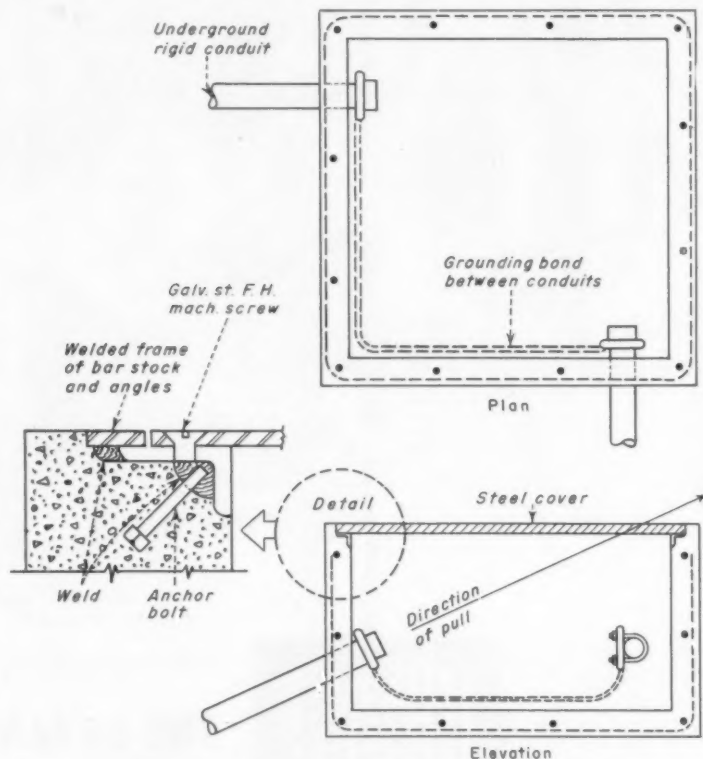
The edge construction of the box is formed basically by angle irons, legs extending downward and outward from the opening, and strips of flat bar stock are welded along the outer flanges as shown. Since the bar stock is the same thickness as the cover plate, the cover and outer frame are flush, and the surrounding edges of the concrete walls are protected against spalling, chipping or crumbling.

The angle irons are securely tied to the concrete walls by means of protruding anchor bolts which are welded into the desired positions, and the cover is held snug against the frame by means of galvanized flat-head machine screws that engage threaded holes around the perimeter of framing angle members.

Since underground conduits, extending from pull box to pull box, are buried in the ground at an elevation several feet below that of the box bottoms, they are turned upwards in large-radius sweeps at box points, and they pierce the box walls at inclinations which permit the pulling of cables from conduit mouths in straight lines, without coming in contact with the opposite edges of the box.

To maintain continuity of ground in this underground conduit system, conduits are bonded together in all boxes by extending bare copper straps from coupling to coupling.

These boxes were constructed in the field by electrical contractors Wismer & Becker and, although simple in construction, proved admirable for their intended purpose.



**FLAT STEEL BARS** were welded to the outer flanges of angle irons to provide a protective lip around this pull box cover plate. Welding was also employed to secure anchor bolts to the undersides of the angles, thereby creating a means for rigid bonding to the concrete. End bushings of conduits entering each box were bonded to maintain grounding continuity.



METALCLAD SWITCHGEAR

# Cuts Cost of Power System in New Motorola Plant

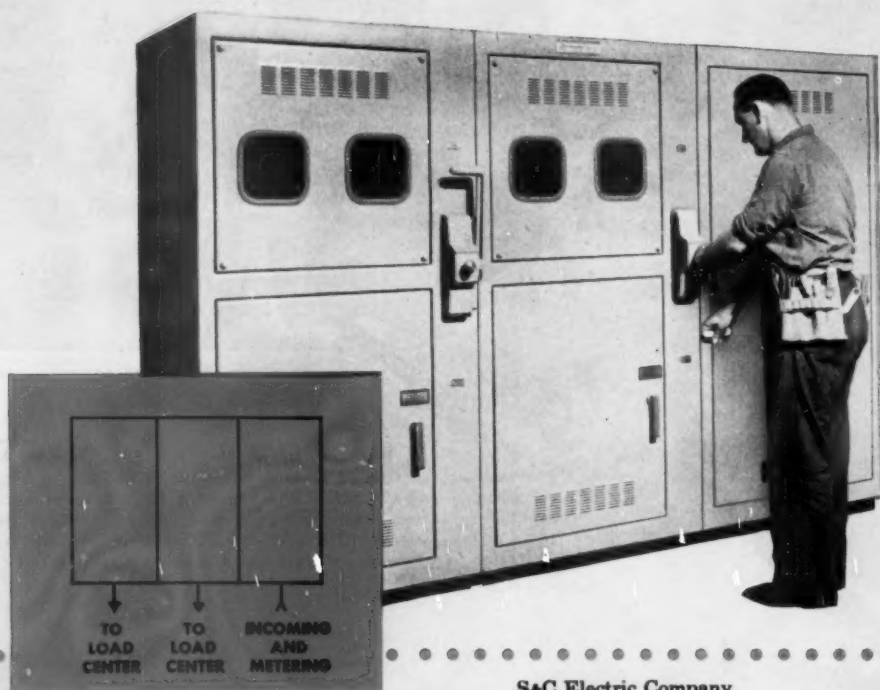
**R**eviewing original proposals for Motorola's new assembly plant, Crescent Engineering Co.—contractor-engineers of Chicago—recommended installing a high-voltage power system to trim material and operating costs. Choosing S&C Metalclad Switchgear to protect and switch the feeders, they reduced high-voltage equipment costs by one half.

To get the most from your construction budget, specify S&C Metalclad Switchgear. Whether your plans for high-voltage power supply are tentative or settled, you can materially reduce your equipment costs with S&C. For booklet containing complete information, send coupon below or address request on company letterhead.



**Mr. John J. Chapp**

President of Crescent Engineering Co. suggested a high-voltage power system with S&C gear to help trim Motorola's construction budget. He says, "Since we engineer every job on which we work, we *must* select equipment that will provide our customers with the best possible service. Our years of experience have shown us that S&C Metalclad Switchgear meets our quality standards and provides lasting, dependable service."



Power is taken in and metered at 4160 volts in the first bay on the right. The following two bays provide protection and switching for the feeders, the center bay serving the fire pump for the sprinkling system, and the left-hand bay supplying load centers in the process and storage areas of the plant. Provisions have been made for adding bays as plant operations expand.

S&C Electric Company  
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

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also available with Glass, Lens Bottom

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**PEERLITE**

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Permits flexible pattern planning. You  
can form any design you wish.  
For 2, 3, or 4 lamps — 4' or 8' long.

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**more cooling  
less cleaning**

Wide open on top and bottom  
for brisk air-circulation

Cool lamps last longer.  
Clean lamps stay brighter.  
Clean fixtures give more light!

**RESULT:** greater efficiency  
less maintenance  
long-lasting beauty

Write on your letterhead today for Catalog 911-A.

**THE EDWIN F. GUTH COMPANY** ST. LOUIS 3, MO.

*Leaders in Lighting Since 1902*



# Modern Lighting

## Supermarket Installation Combines Shielding and Suspension

The ever-present problem of lighting a large grocery center economically as well as effectively was solved in the Duguay & Ribbilar Supermarket, Cambridge, Massachusetts, through the installation of 8- and 4-foot 2-lamp slimline fixtures, pendant-mounted in continuous rows on 7-foot centers at

an elevation of 9 feet above the tiled flooring and 18 inches beneath the acoustical ceiling panels. Installed by electrical contractor J. F. Higgins in accordance with a lighting plan by Norman E. Ticehurst of the Cambridge Electric Light Company, the installation provides an average of 60 foot-

candles to middle shelves, with correspondingly higher and lower intensities delivered to upper or lower display areas.

Fixtures are Smithcraft Federals, with good shielding and upward light combining to minimize brightness ratios between fixtures and ceiling. This results in fairly even brightness throughout the store, highlighting the merchandise without attracting undue attention to the light sources themselves. This combination of shielding, suspension and upward emission of light differs materially from lighting methods used in other markets in the same area, since the other stores are generally illuminated by flush-mounted bare-lamp fixtures that magnify fixture-ceiling contrasts and introduce various degrees of glare.

Lamps in the D&R installation are standard cool white T12s, and pleasing color harmony has been obtained by architect John A. DeLoria who selected a different pastel shade for each of the three walls—the front of the store being all glass, serving as a king-sized sales-promoting showcase.

Owner and customer reactions have both been favorable, as reflected by the gross business which approximately doubled when D&R moved from their inadequately-lighted store a block away from their present location.

Reaction of other lighting engineers was also gratifying, for the installation won for Ticehurst the Grand Award in the 1953 Store Lighting Campaign sponsored by the Electric Institute of Boston.



**SUSPENSION OF FIXTURES**, plus proper shielding and upward emission of light, minimizes brightness contrasts between ceiling panels and light sources, resulting in fairly even illumination within the normal line of vision. Merchandise is displayed under approximately 60 footcandles of standard cool white light.



**ALL GLASS FRONT** serves as a giant showcase, revealing to passers-by the attractively displayed merchandise in this pastel-tinted supermarket. Fixtures are 2-lamp pendant-mounted slimline units, and lamps are operated at 430-milliamps. Shifting their market one block to this well-lighted store helped Duguay & Ribbilar double their former volume of sales.

## Bank's Accountants Get Good Light

Good light is a necessity for critical clerical work, as the First National Bank of Columbus, Georgia is aware. So when they took over a vacated store area next to their existing bank building in Columbus, to be used as temporary quarters for their accounting department, they insisted on a high level of illumination of comfortable quality throughout.

Bank officials called in Jerry Fudge, lighting engineer for Georgia Power Company, and electrical contractors Smith-Gray Electrical Construction Company, and outlined their problem.

Look to the Leader

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Available with  
Klein Nylon  
calf and ankle  
straps attached.

**for NEW COMFORT  
...NEW SAFETY**

Meet the big new favorite—Klein Climbers fully shaped to the contour of calf and ankle. That means a firmer, closer fit... a greater measure of safety. There's a new shape to the extra-wide stirrups also, for more comfortable arch support. Klein Climbers are made of forged steel, individually tempered and tested—aluminized for weather protection. Matched in pairs—adjustable length patterns 15 to 18 inches, specify 1945-ADJ—fixed length patterns 15 to 18½ inches, stock sizes specify 1945.



**KG NO. 1 GAFF GAUGE**  
Keep this precision gauge handy for a safety check on proper spur shape. Plated steel—packed in durable plastic case.

Instructions for sharpening gaff included.

**ASK YOUR SUPPLIER**

Foreign Distributor: International Standard Electric Corp., New York.



**1901-MG GAFF GUARDS**  
Protect the all-important spur of your climbers with this new Klein gaff guard. First quality leather with spring clip.



Write for your free copy of the Klein Pocket Tool Guide today!



**Mathias KLEIN & Sons**  
Established 1857 Chicago, Ill., U.S.A.  
3200 BELMONT AVE., CHICAGO 16, ILL.



**LOUVERED SLIMLINE** luminaires provide 70 footcandles of good quality lighting for accounting department employees of the First National Bank of Columbus, Ga.

Selection of continuous row 2-lamp louvered Day-Brite LUVEX slimline luminaires, with rows spaced on 8-foot centers, solved this problem. The rows were run normal to the walls, and suspended on 24-inch stems from the ceiling, which was painted flat white. This layout provided a uni-

form intensity of 70 footcandles throughout the entire area.

These slimline luminaires were selected so that they may be reused in the offices of a planned future bank building, as well as to provide glare-free illumination in the existing temporary quarters.

## Luggage Shop Installs Light For Sales

An exceptionally well planned and attractive lighting system has been installed recently in Carey's, a high class luggage store in Elmira, N. Y. This lighting system was designed to accent the rich, sales appealing colors and grains of the quality leathers, and to

harmonize with and imp'ement the store's appearance and decor.

The lighting system combines fluorescent and incandescent luminaires, and all equipment is of the recessed type. In the show windows which are of the open back type exposed to the

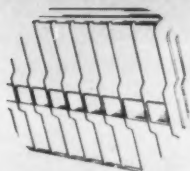
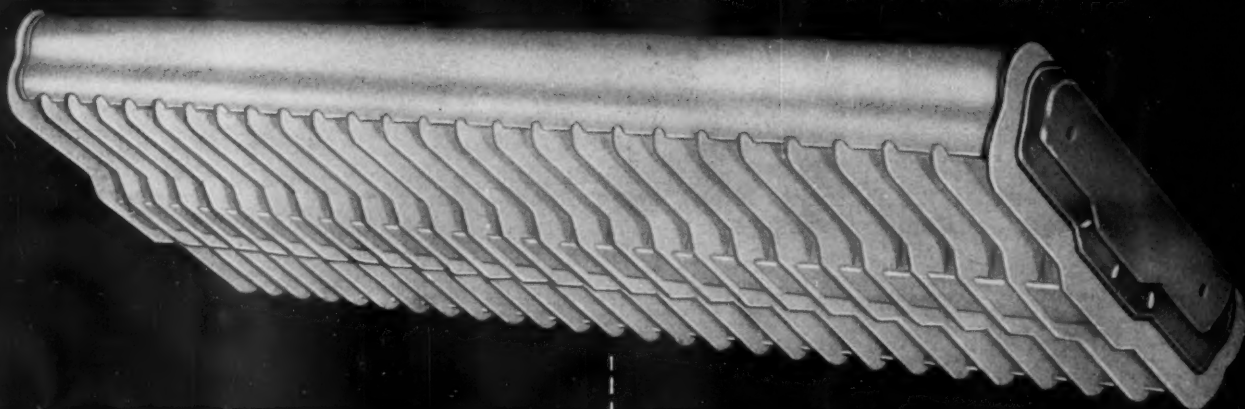


**LIGHT SELLS** merchandise in Carey's luggage shop, Elmira, N. Y. where combination luminous ceiling and recessed incandescent reflectors highlight displays.

# Flexibility PLUS

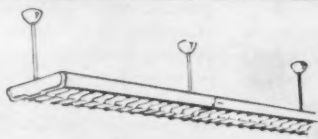
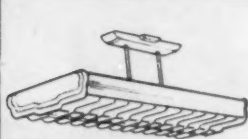
FOR TODAY'S MOST EFFICIENT COMMERCIAL LIGHTING

## Wheeler **FLO-LINER**

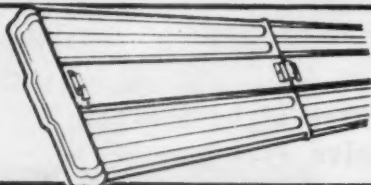


**SHIELDING** — All fixtures provide 45° cross-wise shielding and are available with choice of 25° or 45° lengthwise shielding.

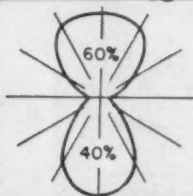
**END CAPS** — Satin finish aluminum end caps available — order separately.



**PENDANT MOUNTING** — Stem hanger assemblies are required. Single stem hangers used for continuous row mounting. Twin stem hangers for the mounting of individual 48" lamp fixtures.

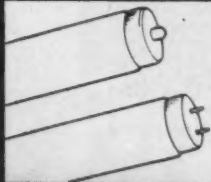


**SURFACE MOUNTING** — Units may be attached directly to the ceiling. Available as optional equipment are surface mounting plates and top reflectors.



A quality fixture throughout!

**85% EFFICIENCY** — Translucent plastic side panels and center panel give low brightness for more comfortable seeing and high efficiency. Made of sturdy Polystyrene, they will not warp or discolor. For further seeing comfort 60% of the light is directed above the horizontal.



**FIXTURES** — 2 lamp and 4 lamp units available for 48 inch 38 watt and 96 inch 74 watt single pin lamps, as well as 48 inch 40 watt bi-pin lamps.

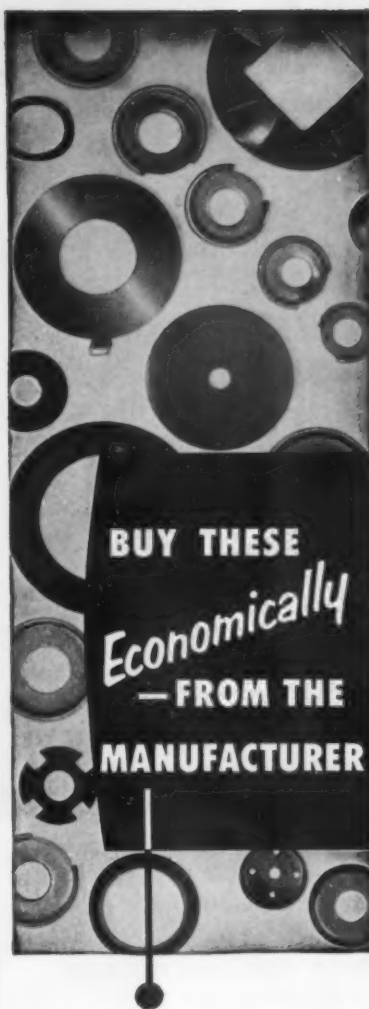
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When you're ordering CUP WASHERS for binding screws; FLAT WASHERS; SPRING TENSION WASHERS, spherical or form rim type, whether you want them made from spring brass, phosphor bronze, or spring steel, and tempered: *save yourself money by buying from the manufacturer.*

The Whitehead Catalog lists hundreds of washer sizes; cable clips; pipe, conduit, and wire clips; burrs, plugs, spacer shims, retainers, gaskets. Write for this catalog and—buy what you need from it—Economically!



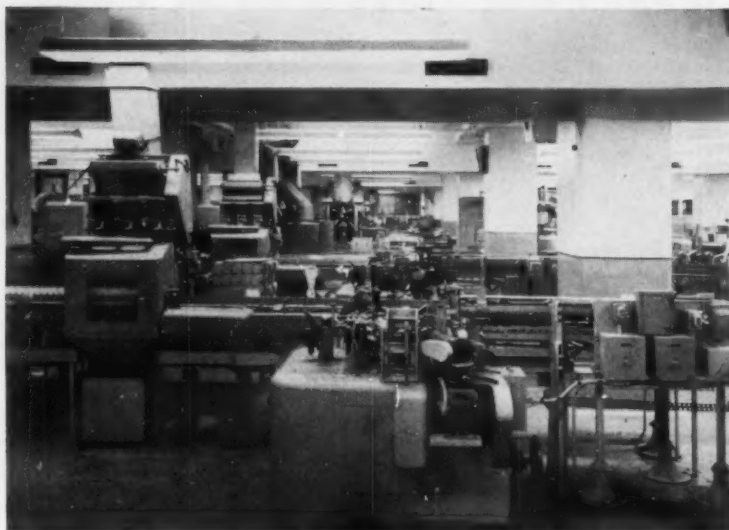
**WHITEHEAD  
STAMPING CO.**

1679 W. Lafayette Blvd.  
Detroit 16, Michigan

store interior, 150-watt lens-shielded lamps are recessed. Over counters and display tables are recessed continuous troffer units and both fixed and adjustable type recessed lens units. And for general lighting within the store proper are ten-foot-square luminous panels which provide glare-free illumination in excess of 100 footcandles. These panels are Smithcraft "Area Illumination" equipment, using fluorescent lamps spaced 12 inches on

centers above 24-inch-square panels of Corning Albalite glass panels. Showcase lights accent smaller items.

This lighting installation was planned by Larry Sweetland, illuminating engineer with New York State Electric & Gas Corporation, and installed by C. H. and J. T. Kelly Electric Company, electrical contractors. Equipment was purchased through LeValley-McLeod, electrical distributors, all of Elmira, N. Y.



OPEN TOP low brightness luminaires in packaging room provide . . .

## Quality Lighting In Industrial Area

The spice packaging room of McCormick & Company, Inc., Baltimore, is lighted to an intensity of 80 footcandles. Also, the visual environment is excellent, with machines, walls, ceilings and floors finished with suitable reflectances to keep brightness ratios at a minimum.

The packaging room covers an area 100 feet by 125 feet. The ceilings were painted flat white. The columns and sidewalls were painted a light buff with a light gray dado. The machines were finished in light gray. A direct-indirect system of lighting was installed, consisting of 210 Curtis Coronet luminaires of the 2/100-watt type, having louvered bottoms, metal sides, and open tops which permits an abundance of light to be directed to the ceiling.

Although this is an industrial area, the lighting is of a quality and quantity comparable with good office lighting. Brightness readings show footlambert values as follows: ceiling—30 to 70; walls—10 to 12; machines—7 to 10; and floors—13.

This area was formerly lighted with 2/90-watt type fluorescent industrial

units which directed all the light downward. Units were located over only the essential work areas of the packaging machines, which gave a non-uniform lighting result and a rather drab appearance.

H. M. White, lighting engineer with the Consolidated Gas Electric Light & Power Company of Baltimore co-operated with the owners in designing the new lighting system.

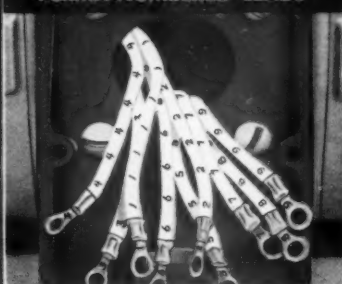
## Three Light Sources Solve Problem

Variations in structural contours, such as saw-tooth construction of tellers' cages and a multi-level ceiling design, presented an interesting lighting problem to illuminating engineer Perley Weatherbee of the Central Maine Power Company, who was consulted by architects Wadsworth, Boston and Tuttle when they designed the Pepperell Trust Company bank building in Biddeford, Maine. The objective was to obtain a high level of illumination in the tellers' area, a somewhat



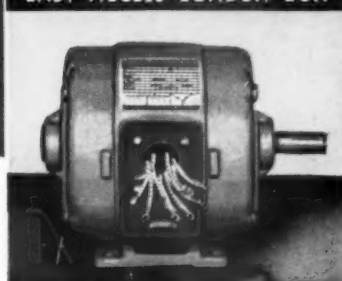
**TRI 55 CLAD** THE LEADER IN MODERN MOTOR DESIGN

**PERMA-NUMBERED LEADS**



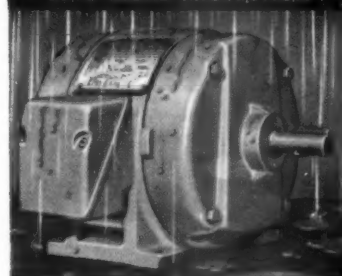
**EASIER TO SERVICE**, clipped or taped terminals always can be read. You save hooking-up time.

**EASY ACCESS CONDUIT BOX**



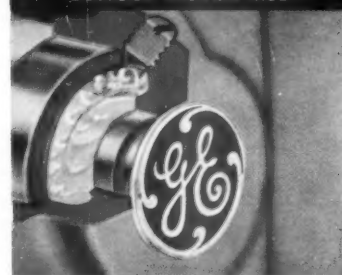
**LARGE CONDUIT BOX** is diagonally split—gives you ample knuckle room for easier wiring.

**60% MORE PROTECTION**



**MORE FULLY PROTECTED** motor achieved through redesign of cast iron frame and end shields.

**LONGER MOTOR LIFE**



**NEW BEARING SYSTEM** means the G-E motor runs longer without relubrication than any other.



Now, easier installation, less maintenance . . .

# G.E.'s new **TRI 55 CLAD** motor— you can install it and forget it!

The all-new General Electric Tri/Clad '55' motor is specially engineered to reduce your installation costs . . . and run longer, without attention, than ordinary motors. This new motor gives you 60% more physical protection plus longer electrical life. In addition, a bearing system designed to use the most modern greases means you will not have to re-grease the Tri/Clad '55' for years.

You save with the new Tri/Clad '55' because wiring is easier and faster. The large, diagonally split conduit box gives you plenty of knuckle room. Leads are perma-numbered . . . you can always identify them instantly.

The new Tri/Clad '55' also brings you important handling, storing and installing economies. Better use of space within the frame means a 30% reduction in size and weight in some ratings. Yet active materials (magnetic steel and copper) are not sacrificed.

General Electric Tri/Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6013—Dripproof motors, GEA-6012—Enclosed motors, GEA-6027—Gear-motors. General Electric Company, Section 648-7, Schenectady 5, N. Y.

*Progress is our most important product*

**GENERAL  ELECTRIC**



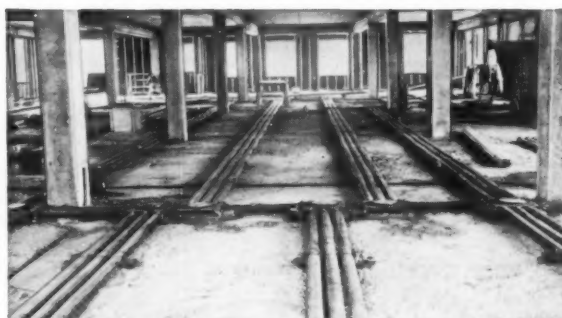
One view inside the new Improved Risk Mutuals building in White Plains, N. Y. Connections for the electrical equipment, telephones, and intercoms are provided by convenient floor outlets.

## How to provide more outlets—now and in the future

**G-E Fiberduct underfloor raceways let you locate electrical outlets where you want them—without exposed wiring—without high costs.**

Here's a sensible underfloor electrical raceway system that carries electric power, telephone, and inter-office communications circuits, and provides as many outlets as your client may need—wherever he needs them. And when electrical requirements change, it provides additional outlets without tearing up the floor or disrupting business. Yet the cost is low, because Fiberduct is made of a strong, yet inexpensive, fibrous compound that can be sawed and fitted easily.

Specify G-E Fiberduct in your wiring plans for commercial and industrial buildings, to keep wiring out of the way, and to provide electrical versatility and expansibility—at a price your client can afford.



**THE FIBERDUCT GRID** under the floors of the Improved Risk Mutuals building provides outlets wherever they're needed, and makes electrical expansion easy.

For more information, write Section C37-918, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**



**LOUVERED TROFFERS**, surface-mounted lensed luminaires and recessed lensed squares were combined to illuminate this banking institution in Biddeford, Maine.

lower intensity in the public space, yet use complementary-appearing light sources in all areas and keep the entire installation in harmony with the modern yet simple decor of this banking institution.

As installed by electrical contractor D. Kerwin Twomey, the plan employs continuous runs of low brightness 2-lamp louvered fluorescent troffers above tellers' desks, surface-mounted units over the book-keeping area and, over the public section, continuous rows of ceiling-mounted prismatic glass units coming together at a right-

angle intersection, plus a single 4-lens square incandescent fixture approximately in the center of the customers' sections. The overall installation combines Holophane, Day-Brite and Curtis fixtures in this effective treatment.

Natural wood panels, acoustical plaster and light terrazzo were selected as high-reflectivity wall, ceiling and floor surfaces. Ceiling heights are 8- and 11-feet in tellers' and public space respectively, while metered light readings for customers', directors' and tellers' sections are 45-, 70- and 75 footcandles, in that order.



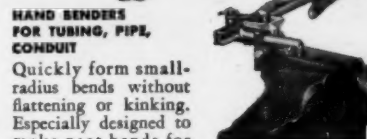
**APPLIANCE SHOWROOM** of the Georgia Power Company, Atlanta, Ga., is lighted by continuous row 4-lamp slimline louvered luminaires with PAR-38 reflector spots installed between 8-foot long units. An intensity of 50 footcandles of general lighting abounds throughout the 1,898 square foot area, and feature displays can be highlighted to double that intensity by the reflector spotlights. The lighting system consists of two rows of Electro Silv-A-King "Skylouwer" fluorescent units, spaced 14-feet apart. Each unit is equipped with four 96-inch T-12, 75-watt slimline lamps. The rows are suspended 18 inches down from the ceiling; the fixtures incorporate styrene louvers and side panels which provide diffusion of light. Electrical Contractor was D'Arcy Electric Co., Atlanta.

## CUT COSTS WITH GREENLEE TIMESAVING TOOLS FOR ELECTRICIANS



### HYDRAULIC BENDERS FOR CONDUIT, PIPE

Quickly produce your own bends *right on the job*. With a GREENLEE Bender *one man* in but a few minutes makes smooth, accurate bends in pipe and conduit up to 5". Compact, portable . . . saves hours, saves materials.



### HAND BENDERS FOR TUBING, PIPE, CONDUIT

Quickly form small-radius bends without flattening or kinking. Especially designed to make neat bends for sharp corners, nooks and other close quarters. Saves up to 75% in time and materials on many jobs.

### KNOCKOUT PUNCHES AND CUTTERS

For fast, easy enlarging of knockouts and cutting of holes in metal boxes, cabinets, panels. Various sizes and models for making openings for conduit sizes from 1/2" up to 3 1/2". To operate, simply turn with a wrench.



### HYDRAULIC KNOCKOUT PUNCH DRIVER

Portable hydraulic unit for driving GREENLEE Knockout Punches. Speeds jobs . . . easily operated. Develops over

11 tons of pressure so that conduit openings are cut in 10-gauge metal with ease.



### CABLE PULLER AND BORING TOOLS

Specifically designed to save time, speed jobs . . . eliminate tedious, heavy work. Companion tools to

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Write for new Electrical Tool Folder, Greenlee Tool Co., 1749 Columbia Ave., Rockford, Ill.

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## For building lighting business

**The Competition closes on December 1st**

Lighting Competition Chairman  
**ELECTRICAL CONSTRUCTION AND MAINTENANCE**  
330 West 42nd Street, New York 36, N. Y.

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- ★ \$1350 in cash awards
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## Here's how I can help you convince management

Put yourself in management's shoes for a minute. For certain, you'd be taking a look—a *long* one—at practical ways to make your products better, faster, cheaper. Competition has forced just such a look.

And that's where I—and Westinghouse Distributors like me—can help you convince plant management.

We'll show you how our products and headquarters engineering services mean better plant efficiency, fewer outages, less maintenance—tangible benefits that make sense to the men upstairs.

### PROOF?

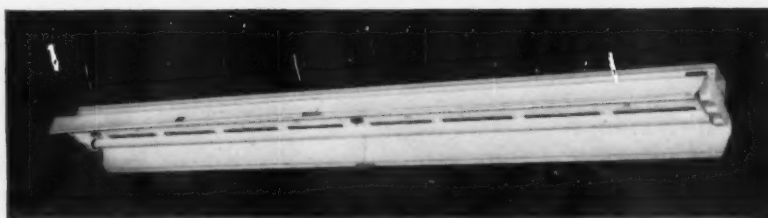
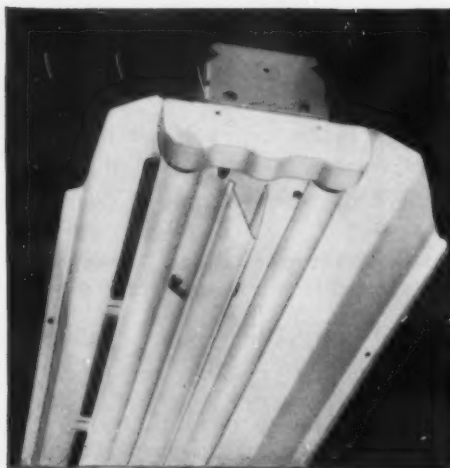
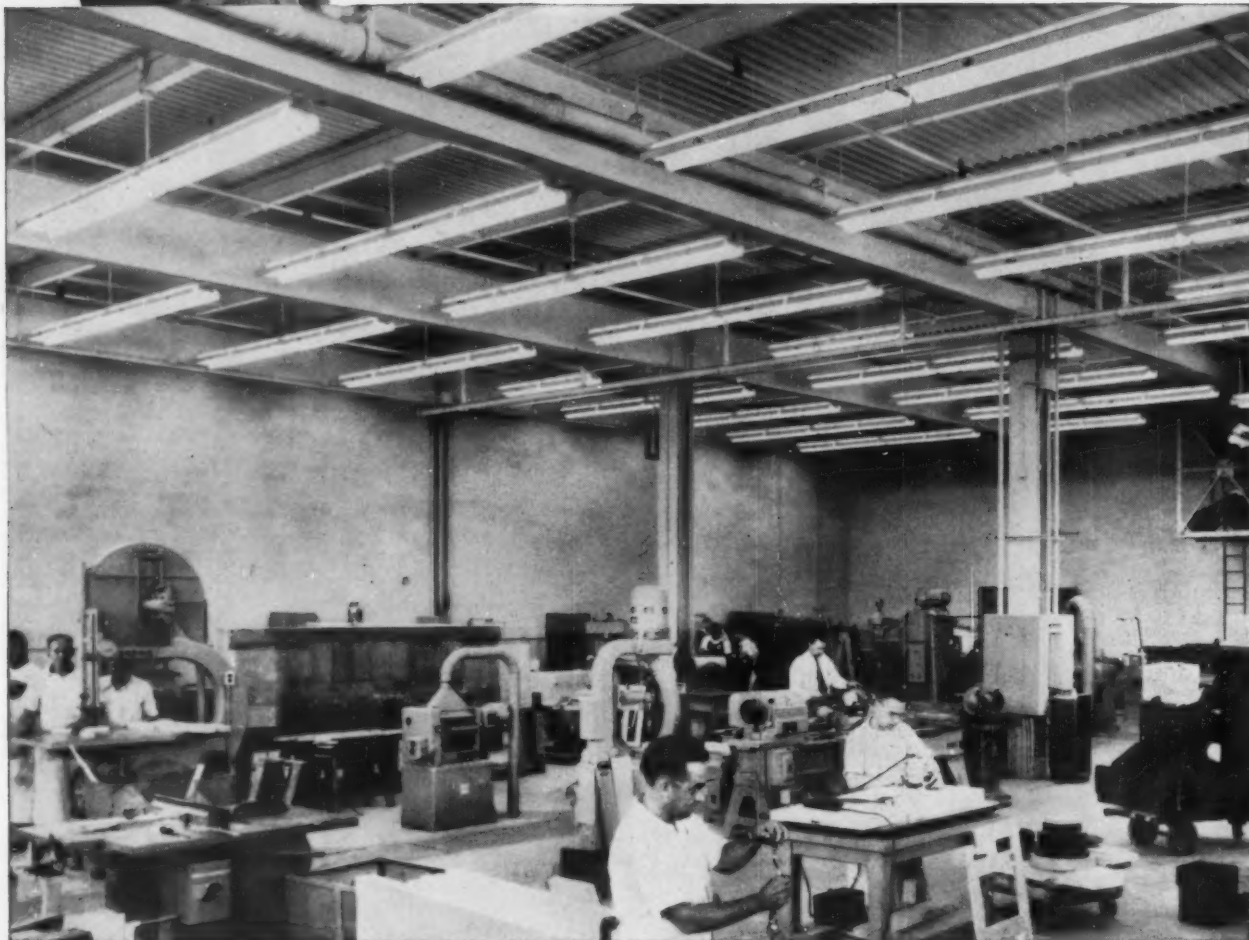
Check the next seven pages for specific examples of how Westinghouse products and services help you sell yourself to management... DP-5004-A

YOU CAN BE **SURE**...IF IT'S  
**Westinghouse**





*A common sense recommendation for improved production: upward component lighting. The better the light, the better people can work.*



Westinghouse upward component fixture means this to plant management: Better efficiency in those areas where effortless, accurate vision is essential. Fixtures stay clean longer . . . operate cooler due to air circulating through apertures in reflector. Less maintenance is required. Available in slotted and non-slotted styles.

These construction features simplify job for installers and maintainers. One-piece channel is lightweight, easy to handle. Large, easy-to-grip wing locks hold reflector in place . . . no loose parts, no tools needed for installation or removal of reflector. Steel-enclosed lamp holder eliminates breakage. Starter socket is positively identified.

DP-5004-B

## New Westinghouse SDP Luminaires step up work quality and safety

Semidirect lighting was recommended for this plant's new wing where high production depends materially on critical seeing.

2200 Westinghouse SDP's were installed, making possible more comfortable lighting at higher illumination levels. Their 22% upward component of lighting makes the light-colored ceiling a part of the lighting system.

Result: Shadows and uncomfortable brightness disappear. Better working conditions and safety are assured.

Whether it's for modernization or new construction, Westinghouse has a wide variety of luminaires to answer industrial lighting problems.

Your Westinghouse Distributor has the facts.

## Use dry-type transformers to supply plant lighting from high-voltage distribution

Westinghouse Dry-Type Transformers enable you to serve your lighting loads from a high voltage power distribution system . . . economically.

That means you can serve both power and lighting loads with economical high-voltage distribution—reducing it to utilization levels close to the center of the load.

The benefits are immediate. There's less copper to buy. Excessive line losses resulting from long low voltage runs are eliminated, and better voltage regulation is assured.

The small, lightweight dry-type transformers are easy to mount—can be installed on walls, posts or overhead platforms. No vaults or protective barriers.

DP-5004-C

Type E, totally-enclosed dry-type transformer is ideal where dirt, lint and nonexplosive dust are a problem. Small and lightweight; can be installed anywhere. Maintenance practically eliminated. Periodic blowout unnecessary.



YOU CAN BE **SURE**...IF IT'S **Westinghouse** 

# Westinghouse Distribution Panelboards feature screw driver convertibility



*Here's a product flexibility story that spells out this benefit to management: quick production change-overs.*

Westinghouse Convertible Distribution Panelboards have designed-in flexibility to easily accommodate the change-overs modern industry is continually making in its production lines.

Circuit rearrangement—to meet load shifts or expanding power requirements—can be made quickly and economically.

Type CDP panelboard, above, is an example of how Westinghouse designs flexibility into an electrical system to meet load shifts. Its convertibility feature means that one or more breakers can be replaced with larger or smaller ones to match circuit protection specifically to a plant's changing production facilities.

And this conversion can be made with a screw driver—due to the pre-tapped busbars, back pan and other standardized parts.

DP-5004-D

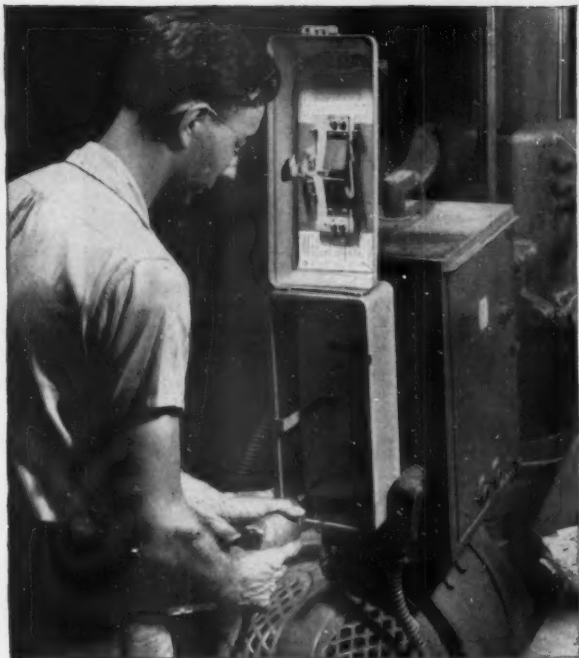
Type CDP—designed for flexibility in rearranging circuits to changing load conditions. You can change over branch circuits quickly and easily with this panelboard. Buses and back pan are drilled and tapped to accommodate any breaker from 15 to 600 amperes.

*More Westinghouse product benefits that help you sell better, lower cost production through modern electrical practices . . .*



**YOU CAN BE SURE...IF IT'S**

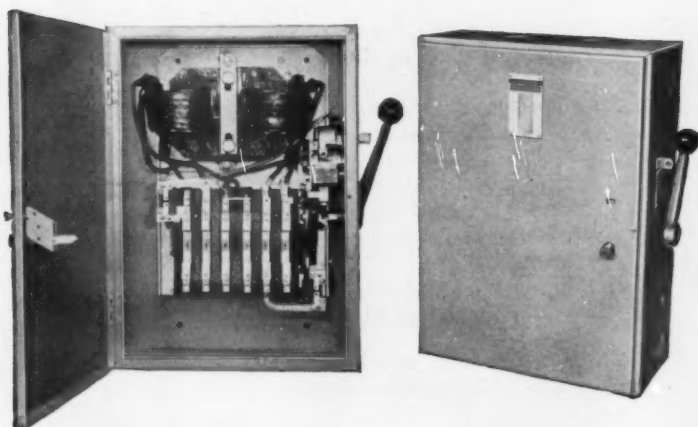




**"Package plan"** speeds your AB-I installations. Enclosures and breakers are packaged separately. It's no longer necessary to remove breaker before mounting enclosure. Mount enclosure first. Make conduit and cable runs. Then, insert AB breaker and connect it in the enclosure. This cuts one installation step. Enclosures and breakers available from stock.



Sell less down time with AB-I's by checking off these circuit breaker advantages: 1. No tripping on temporary, harmless overloads. 2. Service restored speedily after heavy overload interruption. A flip of the handle does it. 3. No danger of over- or under-fusing. No fuses to stock or replace. Shown above: new NEMA XII (JIC Standards) enclosure.



**New Type MB manual auto starter.** Designed for application wherever across-the-line starting current of squirrel-cage induction motors is likely to exceed local power restrictions or interfere with plant operations. Keeps current inrush within limits and still gives maximum starting torque. Protects against overload or low voltage.

**Consider these advantages of the new Type MB auto starter.** All sizes employ double-break, silver-alloy contacts—minimizing pitting, burning, sticking. Oiling of moving parts not required. Foolproof, too, operating handle cannot be moved from start-to-run position until specific acceleration period has elapsed. Trouble-free sequence mechanism, operated by synchronous motor, does the timing.

DP-5004-E

# Westinghouse





## New heavy-duty enclosed switch spells added protection for operators

Complete protection for operating personnel. This is an outstanding feature of the new Westinghouse Type "H" Safety Switch—now ready for rugged, heavy-duty industrial applications.

Available in a complete range (up to 1200 amps and 600 volts), it provides an interlocked cover that cannot be opened when the switch is in the "ON" position. And a Micarta® shield is located over the line terminals. Thus, exposure to the live parts is minimized during inspections or fuse replacement.

Further, this new safety switch offers these "plus" advantages:

1. Neoprene gasket and trunk-type cover latches—resulting in Nema-1A dust-resisting enclosure.

2. Operating mechanism is contained in a rugged cast handle—leaving side gutters free for wiring.
3. Copper parts are tin plated—minimizing corrosion and high resistance oxidation.
4. Westinghouse Exclusive Diamond-pointed Break Jaw and Extended Blade. Arcing occurs outside contact area—keeping parts clean.
5. Westinghouse Exclusive De-ion® Arc Quenchers—extending contact life.

The new Type "H" safety switch is part of a complete Westinghouse line—available for every industrial application.

DP-3004-F

YOU CAN BE SURE...IF IT'S  
**Westinghouse**



# Aluminum bus bars now available in Westinghouse Bus Duct

Westinghouse Bus Duct with aluminum bus bars is new. And highly significant is the plating process—the positive adhesion of silver to aluminum to assure low electrical resistance at bus bar connections.

This exacting process involves electroplating over zincate. It utilizes a silver-on-silver plating method. Better adhesion is obtained. Corrosive action is minimized.

*If damage causes a break-through in the silver plating, the silver undercoat will not form a resistant oxide.*

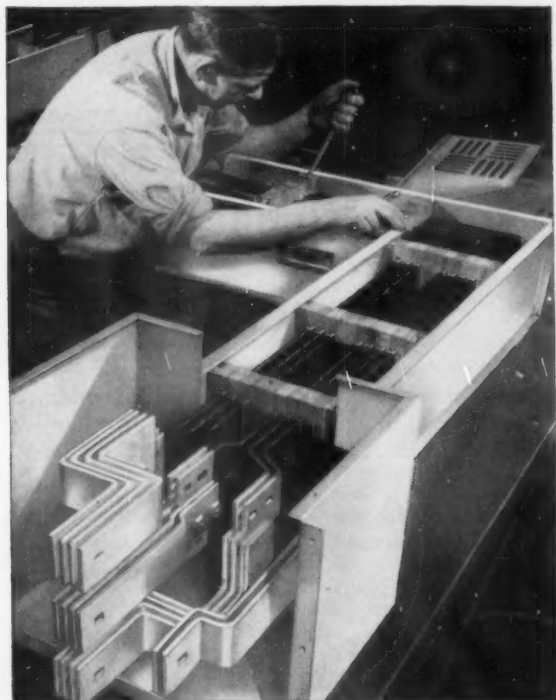
Additionally, new aluminum bus duct offers these features inherent to the complete Westinghouse Bus Duct line:

**More power per dollar.** Presently available through 3000 amperes, it has greater current-carrying capacity, pound for pound, than cable and conduit.

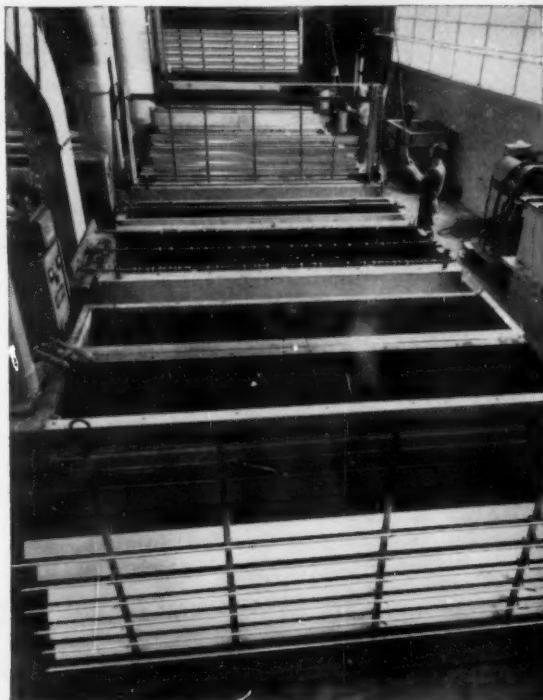
**Lower installation cost.** Prefabricated in sections, bus duct goes in faster than cable and conduit.

**Unequaled flexibility.** Installs easily in any layout around any obstruction. Can be relocated at any time.

DP-5004-G



Final assembly follows plating process that guarantees silver adhesion, thickness and uniformity on aluminum bus bars.



Silver-on-silver plating process uses selective tanks and timing controls with modern automatic and mechanized equipment.



			
LIFE-LINE "A" MOTORS	LIFE-LINE STARTERS	AB-1 CIRCUIT BREAKERS	PANELBOARDS
			
CAPACITORS	BUILDING-TYPE SWITCHBOARDS	POWER CENTERS	BUS DUCT
			
CONTROL CENTERS	INDUSTRIAL LIGHTING		DRY-TYPE TRANSFORMERS

## A complete line of products from a single source

It means this: Your nearby Westinghouse Distributor is a one-call, one-stop source for your electrical apparatus requirements.

He offers complete product lines—Westinghouse Apparatus that's engineered for simplicity and features standardized design to speed your installation work.

He has full product stocks readily available from centralized warehousing facilities. This pinpoints responsibility. It assures quick delivery and helps

you make your installations in minimum time.

And through your Westinghouse Distributor you get all the engineering, product and application assistance you want. Teams of Westinghouse specialists bring these to you . . . help analyze the electrical problem . . . select, coordinate and apply equipment.

Get in touch with your Westinghouse Distributor for complete information. He is as near as your telephone.

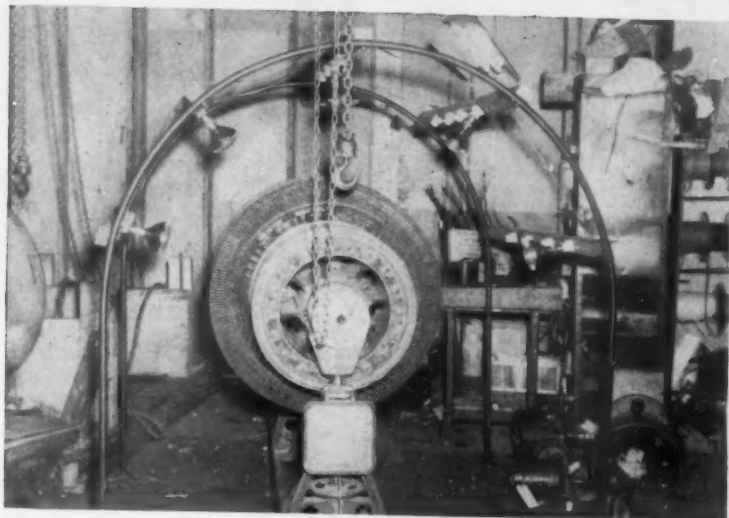
DP-5004-H

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**Westinghouse**





# Motor Shops



## Baking Rig for Large Armatures

A special pipe rig of heat lamps for baking large armatures has been constructed in the motor shop of the J. J. Smith Electric Motor Co., Philadelphia, Pa. The rig is completely portable; can be moved to the armature, eliminating necessity of moving heavy armatures.

As shown in the photo, the rig consists of infrared heat lamps mounted on socket strips which hold two in-

verted "U" shaped pipe members together. Flanges are used on the pipe ends as bases. The cross bars which contain the lamp sockets are pieces of 2 by 3 and are bolted to the pipe frames. Amount of heat is regulated simply by varying the number of lamps used.

This portable rig, which is easily moved and placed over any armature, operates without any cover, taking full advantage of air circulation.

## Revolving Tool Rack

A revolving tool rack, centrally located in the motor shop of the Wagner Electric Service Co., Phila., Pa., provides easy access to all tools by motor shop employees.

This tool rack is 4-sided and has been constructed in a pyramid-like shape. It is approximately 3 feet across the bottom, 18 inches across the top, and about 4 feet high. The four sides are constructed of 3-ply plywood, with hooks mounted to act as holders for the many small tools.

The tool rack is supported from a vertical length of pipe which runs from the floor to the ceiling. It has a bearing in the center of the tool holder on either end, and the tool holder is kept at waist-high level by a bolt under the bottom bearing.

Shop employees in taking tools from this rack only have to spin it around to the spot where the tool they desire is hung. Tools are immediately replaced by employees after they have

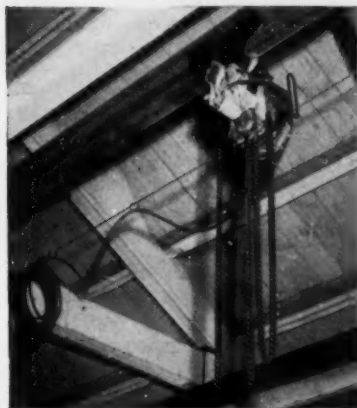


used them. Because of its central location the rack has saved a lot of time.

## Messenger Cable Supports Power Feeder for Hoist

To facilitate the shifting of motors and other heavy equipment from one location to another in the shop and warehouse of the Ray Bigger Electrical Equipment Company in Klamath Falls, Ore., an I-beam assembly was extended the full length of the high-ceilinged building and a 4-wheel electric hoist was installed to travel along the beam's lower flanges. Power for the hoist was provided through a rubber-sheathed coiled cable which was supported at close intervals by metal rings. Rings, in turn, were looped over a parallel messenger cable.

This arrangement permits the cable to coil neatly when the remotely-controlled hoist is at the end of the I-beam

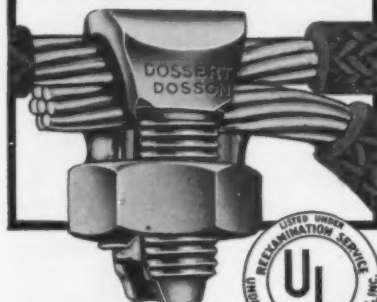


**MONORAIL HOIST** travels length of motor shop, with power provided through a coiled rubber-sheathed cable that, in turn, is supported by rings riding along a parallel messenger cable.

track nearest to the power take-off point, and the coil straightens out as the hoist moves in the opposite direction. To support the I-beam track beneath roof trusses, steel base plates were welded to the beam's upper flanges at all truss locations, then bolts were extended up to steel yokes bracketing these hefty members.

When this monorail hoist and messenger-cable supporting means was first installed, it was assumed that a more elaborate crane system would be erected at a later date. This method, however, has proved to be adequate in capacity, trouble-free in operation and suitable for all shop lifting purposes so, although simple in design, no thought exists concerning its replacement.

# NEW! DOSSON "F" SPLIT BOLT CONNECTOR



## For:

taps, dead-ends, service entrances, motor leads, junction boxes, ground wire-to-neutral connections

Fabricated from high strength alloys, all component parts of the new Dosson "F" Connector are cold formed, insuring consistent uniformity and high quality. Can be used economically over and over again!

## Why It's Your Best Bet:

- high clamping pressure insures tight contact
- maximum tightening force: high translation of tightening torque
- connector alloys possess greater physical properties than average steels
- longer bearing pressure bars avoid conductor crushing, load concentration
- smooth edges can't cut lineman's gloves, nick conductors
- withstands high overload, vibration, corrosion



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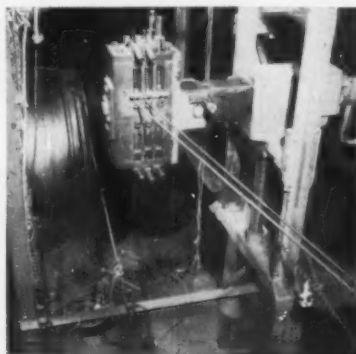
249 HURON STREET, BROOKLYN 23, N. Y.  
SINCE 1904

## Wire Tension Block Has Vertical and Lateral Alignment

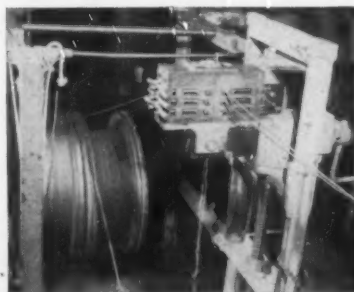
Efficiency in winding coils for electric motors is a function of two prime factors: The skill of the mechanic and the type of equipment provided for his use. Each complements the other. A good mechanic may turn out a quality job with inadequate or obsolete equipment, but his speed will be materially reduced and his overall production will suffer. He has to compensate for too many things which proper equipment normally takes care of.

Management of the motor repair department of Miller-Seldon Electric Company, Detroit, strives for the ultimate in efficiency and quality workmanship. It leaves nothing to be desired in the way of shop equipment. When an item is not available on the market, M-S mechanics will build one of their own design. Or, they may improve on a standard piece of equipment.

Typical of this approach is an adjustable wire tension block designed



**UNIQUE TENSION BLOCK** provides individually adjustable tension to six conductors simultaneously through lever action on compression springs; is mounted to end of vise arm for lateral alignment. Two 0.090 by 0.1335 rectangular conductors are passing through unit.



**BLOCK IS ROTATED 90 degrees** on vise arm and locked in position by spring-bolt if rectangular conductors must be wound edgewise on coil form. Block pivots on bolt mounting.



**VERTICAL ALIGNMENT** of tension block is provided by vertical adjustment screw. Vise assembly rides up and down T-bar uprights of supporting frame. Crank handle operates vise for lateral alignment.

by repair department manager C. R. Medsker and built in the Miller-Seldon shop. The unit provides adjustable tension up to six conductors being simultaneously de-reeled to the winding machine. It also has a vertical and lateral adjustment to permit accurate alignment of the conductors with the winding head—an item considered equally important with tension.

The all-steel device is mounted on a special frame welded to the front of the de-reeling rack. The sectionalized-steel block has six sets of spring-actuated, lever-operated jaws through which a magnet wire passes. Each set of tension jaws can be individually adjusted to wire size by raising the lever to vertical position and adjusting the movable bar with a set screw. Flipping the lever to horizontal position then applies additional pressure to the compression-spring which presses the movable tension jaw against the conductor.

Lateral alignment of the tension block with the winding head is provided by bolting the block to the arm of a machinist's bench vise from which both the stationary and movable jaws have been removed. The block can be moved laterally in small increments as the vise crank is turned clockwise or counterclockwise.

The complete assembly—vise and tension block—can be raised or lowered for vertical alignment by turning a vertical adjusting screw held by a threaded coupling on the channel-iron base of the steel frame. The vise is bolted to a steel cross-piece equipped with flanged end-pieces which ride up and down the T-bar frame uprights. This assembly rests on the end of the adjusting screw and moves up or down as the screw is rotated to the right or left.



150 kva, 80° Rise Wagner Dry-Type Transformer that feeds through control center for the automatic bakery's cooling room.

## reduce power distribution costs with Wagner Dry-Type Transformers

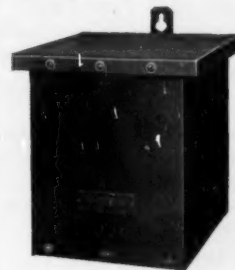
You can save money, save copper, and improve voltage regulation by bringing the right voltage to the load center with Wagner Dry-Type Transformers. They are safe to use—without fireproof vaults or other special protection—even where fire hazards are present. They provide steady voltage with minimum line losses. They are compact and light in weight—economical to install and easy to move when changes in plant facilities are necessary.

The transformer shown in the photograph above is one of 45 Wagner dry-type transformers ranging in size from 5 through 150 kva, installed at Mrs. Baird's Bread Company, Dallas, Texas—the world's largest fully automatic bakery. All motors,

lighting and equipment in the bakery are operated from the low voltage side of the Wagner Transformers that step down power delivered at 480 to 208Y/120 volts.

Wagner has a complete line of dry-type transformers that includes single-phase and three-phase units in ratings from 1 through 500 kva, single-phase and three-phase auto-transformers, and unit substation transformers 112½ through 2000 kva.

Your nearby Wagner engineer can help you select the *right* transformer for your needs. Just call the nearest of our 32 branch offices, or write us.



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6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

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BRAKE SYSTEMS—  
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**FURNAS ELECTRIC**

## Magnetic Starters

Your  
most  
complete  
selection  
in the  
1-50 hp  
range



**NEW "IN-BETWEEN" SIZES  
SAVE ON COSTS AND  
UP TO 40% IN SPACE**

**Why Pay for Starter Capacity You Never Use?** Now you can select the exact starter size matched to any application in the 1-50 hp range from the nine Furnas Electric sizes. Many in-between sizes can save you money and conserve space. Immediate delivery from stock.

**Same Service, Less Money**—Here's an example of how you can save: Suppose you want a starter for 10 hp service. It's no longer necessary to select a size 2 rated 25 hp. You save in cost and up to 40% in space by selecting a Furnas Electric type YE, the right starter for the job.

**Important Features**—1. Dual voltage coils matched to your motor. 2. Four-speed thermal overload protection. 3. Easy installation and wiring in shallow case. 4. Heavy contacts for long life.

**Complete Range of Other Products**—Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for Bulletin No. 5402, giving the full story. Furnas Electric Company, 1067 McKee Street, Batavia, Illinois.

**FURNAS  
ELECTRIC**

Batavia, Illinois

Another refinement was added specifically for use of rectangular wire. Normal operating position of the tension block is with the compression springs in a vertical plane (see Photo 1). With rectangular conductors passing through the block in this position, the flat side of the wire would be in a horizontal plane (facing down). If coils have to be wound edgewise (with the edge of the copper wire down) the tension block is merely rotated 90 degrees to the right on its bolted vise-arm mounting. A spring-bolt locks the tension block to the vise arm in either position.

General consensus in the Miller-Seldon shop is that this unique tension block provides an unusual degree of flexibility and versatility to coil winding operations.

## Baking Oven Has Rotating Lamps

One of the baking ovens in the motor repair shop of Wismer & Becker in Sacramento, Calif., is heated by means of infrared lamps spaced along the top and bottom of each side wall. Upper lamps are mounted in fixed inclined positions, with lamps directed towards the center of the oven so that heat will be concentrated in the area where coils and wound armatures are normally suspended or supported.

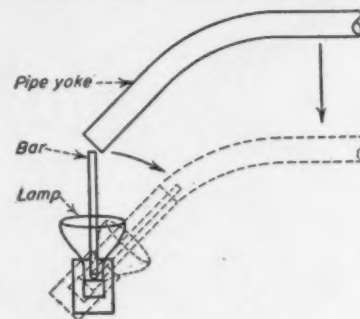
Bottom lamps are also inclined inwards during the actual baking cycles, but they pivot to a vertical position when doors are opened, thereby withdrawing from the path of the armature-carrying dolly as it moves in or out of the enclosure. By keeping lamps focussed inwards during the baking periods, the direction of radiant heat is kept at the angle most conducive to



**INFRARED LAMPS** are mounted on hardwood studs which, in turn, are supported by steel shafts that extend through the front door jambs of this baking oven. Protruding ends of shafts are bent at right angles to form handles, and studs may be rotated by turning these handles inwards.



**PIPE YOKE** slips over ends of bar handles, holding the shafts in a fixed position and keeping the oven door closed, thereby sealing heat within the enclosure.



**UPTURNED BAR** shaft automatically rotates as pipe yoke is lowered. Rotation of bar causes stud inside the oven to assume an inclined position, with lamps then focussed towards central area of oven.

baking efficiency. Then, by swinging the lamps upwards and out of the way when the baking is completed, lamps are less likely to be struck and broken, and a few extra inches of width are provided within the oven for the movement of casted angle-iron carriage.

Since these lower lamps are mounted on horizontal hardwood studs and since studs pivot at the ends on steel shafts that pierce the front door jambs of the oven, it is apparent that the inclination of the lamps can be regulated from outside the oven, when the door is closed, merely by turning the protruding shaft ends the desired amount. To make this easier, the ends of the shafts are bent at right angles to form handles and angle indicators.

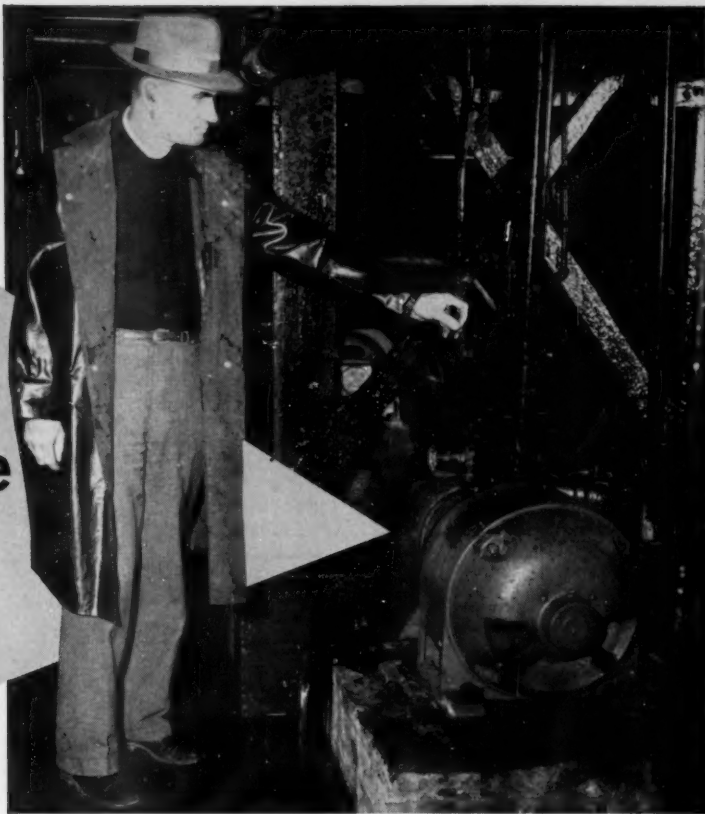
In operation, the oven door is first closed, then a bent pipe yoke is placed across the front of the oven entrance with the open ends of the pipe directly over the upturned tips of the shaft handles. As the pipe yoke is lowered, the shaft handles are forced inward, the bars slipping inside of the pipe. This rotation of the shaft handles automatically rotates the studs inside the oven, turning the lamps to the desired angle. Besides holding the lamps at the proper inclination, the pipe yoke also serves as a door check, keeping it closed.

When baking is complete, the pipe yoke is raised. Then, the lamps are automatically rotated upward and outward toward the sides of the oven.



# DOW CORNING SILICONES

**6 motors for the  
price of one**



**Class H lasts more than 12 times as long as Class A  
in drip-proof pump motors.**

Motors need more than a drip-proof housing when relative humidity reaches 100%. This was effectively demonstrated to engineers at Hood Rubber Company of Watertown, Mass. over eighteen months ago after they had installed two 15 hp Class A drip-proof motors below ground level. Because of conditions in the room, the motors were constantly subjected to condensation and dripping water. In continuous operation 5 days a week but shut down on week ends, the Class A motors were knocked out of service by moisture condensation in less than a month.

Rewound with Class B insulation, the motors still lasted only 3 months. Then Hood tried Class H insulation made with Dow Corning silicones. Rewinding with Class H materials cost about twice as much as a Class A rewind

job, but the motors are still working after more than 12 months of service. That's already 12 times the life of Class A and 4 times the life of Class B insulation under the same operating conditions. With an 83% reduction in maintenance costs established by that experience, Hood engineers plan to have all motors that fail because of heat and excessive moisture rewound with Class H insulation. No wonder there is such a rapidly growing industrial demand for Class H insulation. And savings in maintenance are usually only a small fraction of the total cost of down time. For electric machines with as much as 50% more overload capacity or 10 times their present life expectancy, specify Class H insulation made with Dow Corning silicones.

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.



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Dow Corning Corporation, Dept. G-21, Midland, Michigan  
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- ☐ List of Class H rewind shops
- ☐ List of Class H Motor and ☐ Class H Transformer Manufacturers
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Canada: Dow Corning Silicones Ltd., Toronto • England: Midland Silicones Ltd., London • France: St. Gobain, Paris (SILVER SPRING, MD.)

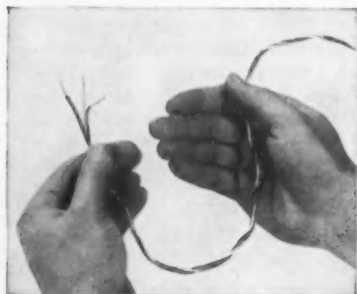
# "G-E REMOTE-CONTROL WIRING is easy and economical to install"

**SAYS**  
**WILLIAM MALEY**  
manager Tico Electric Company  
McKeesport, Pa.

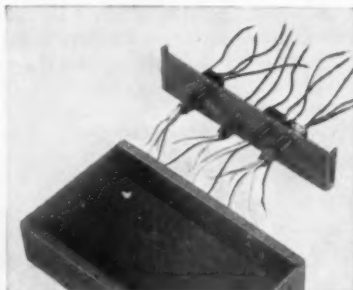


Tico Electric has completed more than 100 installations of remote-control wiring and has contracts for 150 more houses. Mr. Maley thinks that "G-E remote-control wiring is the most modern method of wiring." Tico gives its customers the extra conveniences of remote-control—at little, if any, additional cost.

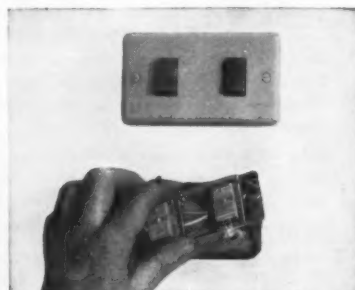
Now you can offer your customers the benefits of this new wiring system. For detailed information, write for the "G-E Remote-control Manual for Residential Wiring Design and Installation," Section D119-918, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



**IT'S AS EASY** to connect up the remote-control wiring system as it is to wire a doorbell. The lightweight, color-coded wire is flexible and strips cleanly.



**REMOVABLE DIVIDER** in new RGB boxes simplifies ganging up to twelve relays for zone grouping. Relays operate on safe 24 volts; pigtails are color-coded.



**WALL SWITCHES** (shown above) control individual circuits. . . . Selector switches control up to 9 circuits. . . . New Circuit Servants control up to 25 circuits.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

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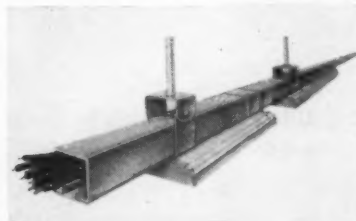
# Product News



**Control Center (1)**

This newly designed control center features flexibility. A removable operator's panel in door of each individual combination plug-in unit accommodates up to four pushbuttons, selector switches, or pilot lights. Construction facilitates removal of control center units. Plug-in control center units are enclosed on all sides to localize damage in case of fault. Unit doors are attached to main structure and can be reclosed after unit is removed. Vertical wiring channels and openings into plug-in units are designed so that wires can be laid in place. A steel barrier separates horizontal wiring channel from horizontal bus bars. High short circuit strength is obtained by edge-to-edge mounting of horizontal bus bars and by use of strong tubular vertical bus. Standard control section dimensions are 20 inches wide, 20 inches deep and 90 inches high; and each section will accommodate up to six combination starter plug-in units. Manual SM 244 is available.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.



**Surface Metal Raceway (2)**

Unistrut channel and fittings have now been approved by Underwriters' Laboratories, Inc. for wiring lighting installations as well as for supplementary power wiring of machines, hand tools, motors, other lighting rows, etc. The system of light support and wiring installs quickly and easily from stock channel and fittings. Hanger stems may be placed anywhere along the channel. Fixtures can be attached at any point to provide spaced

or continuous run installations. UL approval applies to four channel sizes: P-1000, P-2000, P-3000 and P-4000. All channels were approved for wiring up to 600 volts. Fittings approved for the system include: snap-in closer strip, hanger fittings, end caps and joiner fittings. Bulletin FF-3 is available.

Unistrut Products Company, 1013 W. Washington Blvd., Chicago 7, Ill.



**Connector (3)**

A new offset connector for threaded rigid conduit. Fitting eliminates necessity for offsetting conduit at knockout entrances of standard boxes. Made of malleable iron, and cadmium plated. It is available in a range of sizes from 1/2-in. to 2-in.

Gedney Electric Co., RKO Building, Radio City, New York 20, N. Y.

**Studio Clock System (4)**

New studio clock system is designed to meet radio and television broadcasters' demands for a time indicating system which will maintain accurate and uniform time on all studio indicating clocks. With this system, all sweep second hands are supervised once each minute to coordinate them with the second hand of master control. Two types of master controls are available. Either the radio-supervised master clock which is governed by National Bureau of Standards broadcast time signals, or the precision IBM Type 25 master clock equipped with a mercurial or invar pendulum, can be used. System also includes a standby minute impulse unit which will maintain clock operation in event of shutdowns of master clock for maintenance and repair. System may also be operated in conjunction with an hourly supervised wired clock system. Although system is designed especially for radio and television stations, it will have many other applications wherever precision timing is required.

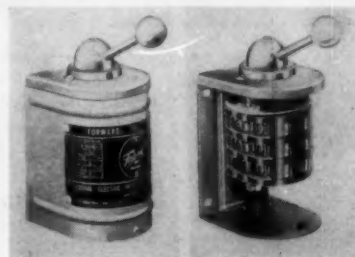
International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.



**Enclosure (5)**

New special industry NEMA 12 enclosure designed for dust-laden atmospheres. Mounting holes and knockouts are omitted to prevent foreign matter as well as oil or coolant from entering the enclosure. External mounting feet simplify mounting installation. Newly designed operating mechanism operates breaker from outside enclosure. Handle may be padlocked in either "On" or "Off" position. Enclosures are available with "E", "F", "J", and "L" frame circuit breakers—in ratings from: 15-600 amps; 125 - 600-volt ac; 125-250-volt dc.

I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.



**Switch (6)**

A new reversing drum switch, Bulletin 905, for all ratings up to 2-hp. It is suitable for use with many types of electrically-driven equipment, including conveyors, hoists, wood and metal working machinery, machine tools, pumps, and processing equipment. It features double-break silver contacts. It is now available in a compact Type A (NEMA Type I) sheet steel enclosure with a U-shaped cover. Mounting holes on bottom and back of enclosure are provided for mounting in various types of locations. Also featured is a reversible operating handle which may be changed to operate from front, back, or either side to facilitate mounting in difficult or obstructed locations.

Federal Pacific Company, 50 Paris St., Newark, N. J.

# PROTECTION

## FOR UNDERGROUND ELECTRICAL CABLES



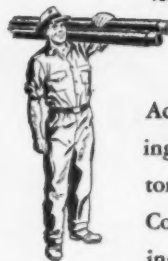
STANDARD PROTECTION — for football — it's the helmet...  
for underground cables — it's Orangeburg Fibre Conduit.



↑ **NOCRETE** for one or two ducts...  
installed without concrete encasement.



↑ **STANDARD** for three or more ducts...  
installed with concrete encasement.



Across the country in every city and state, leading Utilities, Municipalities, Electrical Contractors everywhere have made Orangeburg Fibre Conduit a leader, as its wide use convincingly shows.

You gain many advantages when you use Orangeburg. Its impermeable wall and tight joints prevent corrosive ground waters from entering. Its smooth bore and low coefficient of friction safeguard the cables when pulled in... also from wear during cable movement. Non-metallic Orangeburg does not corrode — resists acids, alkalis, grease, oil. It is tough, resilient, durable — will not crack or break when properly handled. And the installation cost is low because the lightweight 8-foot lengths are quickly connected by Taper-Sleeve Joints with just a few light taps. Orangeburg is easily sawed to any length — easily tooled with an inexpensive lathe.

For these and other reasons, Orangeburg is logically the leader — a first choice of so many public utilities, municipalities and electrical contractors everywhere.

Write to Dept. EC-94 for complete catalog.

**ORANGEBURG MANUFACTURING COMPANY, INC.**  
Orangeburg, New York      West Coast Plant — Newark, Calif.

**ORANGEBURG®**  
**FIBRE CONDUIT**

**STANDARD** INSTALLED  
WITH CONCRETE

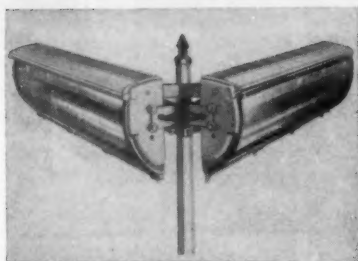
**NOCRETE** INSTALLED  
WITHOUT CONCRETE

**Graybar**  
ELECTRIC COMPANY

DISTRIBUTORS,  
ORANGEBURG  
FIBRE CONDUIT

**GENERAL ELECTRIC**  
**SUPPLY COMPANY**

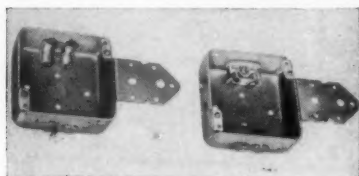
BRANCHES AND STOCKS IN PRINCIPAL CITIES      A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION



#### Fluorescent Unit (7)

New four-lamp, V-shaped fluorescent luminaire which accommodates 6-foot lamps. It provides a Type IV distribution pattern and is designed for street lighting applications at a mounting height of 25 feet, or higher. Two lamps are housed in each leg of the V, or one lamp in each leg may be interconnected to a single ballast. Terminal blocks inside each leg facilitate connections. All metallic parts of unit are aluminum, except for non-ferrous fittings. Cover is a translucent plastic which is hinged at top and latched at bottom for easy connection, relamping, and maintenance. Unit is weatherproof.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.



#### Boxes (8)

New 4-in. square boxes are now available with brackets for either face or side mounting to studs. "B" Type brackets are designed for mounting on face of stud, "V" type for side mounting. Brackets are stamped from sheet steel and are welded to side of box. Boxes are furnished with 1/2-in., 3/4-in., or combination 1/2-in. and 3/4-in. knockouts. Eight No. 12 wires can be used in these boxes. Boxes are furnished with clamps for armored cable or non-metallic sheathed cable. Catalog is available.

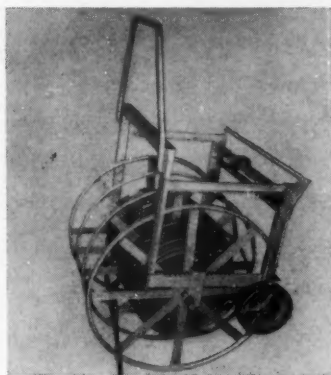
Keystone Manufacturing Company, 23328 Sherwood Ave., Center Line, Mich.

#### Cable (9)

New Type UF (Underground Feeder) cable derives its corrosive resistant characteristics from thermoplastic insulation. On the multi-conductor cables a fibre glass wrap separates the individual conductor insulation from the cable jacket. Cable can be buried directly into the ground as feeders or branch circuits when provided with overcurrent protection; snaked inside masonry block walls; imbedded in plaster or in a shallow chase in masonry block walls when provided with adequate mechanical protection; and used

for exposed or concealed wiring in dry, wet or corrosive locations. UF cable is available with single conductor in sizes No. 14-No. 4, and with two and three conductors, sizes No. 14-No. 10, solid or stranded. It is also recognized for use as Type NMC—non-metallic sheathed cable, corrosive resistant.

Triangle Conduit & Cable Co., Inc., New Brunswick, N. J.



#### Reels (10)

Three and four compartment reels offer new convenience for handlers of cable, wire rope and messenger strand. Used in conjunction with a Reel-O-Matic unit, cable can be measured, coiled and cut to proper lengths for each compartment of reel in the warehouse instead of on the job. Complete reel can then be shipped to the job where it is ready for immediate use at the point of installation.

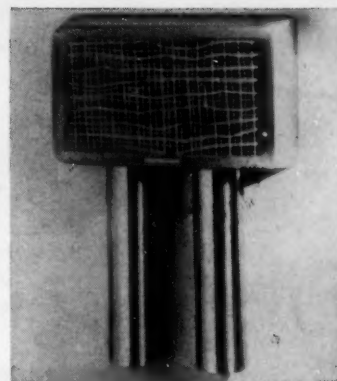
Columbia Industries, Inc., Columbia, Pa.



#### Cable Clamp (11)

New type "PK" armored cable clamp is designed for terminating interlocked armored cable. Features offered are slotted hex bolts that may be tightened either by wrench or screw driver and a flanged body. It is designed with ample thread length for use with all standard conduit fittings and terminators from 1-in. to 5-in. and is available for interlocked armored cable ranging in size from .99-in. O.D. to 4.38-in. O.D. Bakelite insulating bushings are provided to protect individual conductors at point where they emerge from the fitting.

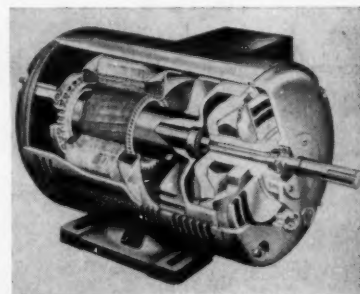
O. Z. Electrical Manufacturing Co., Inc., 262 Bond St., Brooklyn 17, N. Y.



#### Door Chime (12)

A new line of door chimes, known as the "Lido", which sounds two distinct notes for the front entrance and a single note for the rear. Panel is of plastic, framed in a metal cover. Overall dimensions are 9 by 8 1/2-in. wide and 12-in. high. "Lido" is available in three color combinations—desert sand with brushed brass tubes, eggshell white and brass, or eggshell white and chrome. It is equipped with the floating striker that has a lifetime guarantee.

Rittenhouse Company, Inc., Honeoye Falls, N. Y.



#### Control Units (13)

A line of combination power and speed control units engineered for fhp drives. Known as fractional horsepower adjustable-speed drives, the units are an integral combination of ac constant speed induction motors, eddy-current couplings, and electronic speed controls. Under constant torque or fan type load, the drive may be operated continuously at any speed within the limits of the speed range. Electronic control insures speed stability of plus or minus 2% of top speed at any point within the range. A simple connection to a standard single or three-phase electrical power line is all the wiring that is required. For remote control operations, only minute current is required for speed setting potentiometer circuit, which may be located as far as 100 feet away from the equipment. Models are designed for mounting on wall, ceiling, or floor. Drives are available in 115/220 volts, single phase or 220/440 volts, three phase.

Dynamatic Division, Eaton Manufacturing Co., Kenosha, Wis.



# IMPORTANT NEWS!

## FOR CONTRACTORS

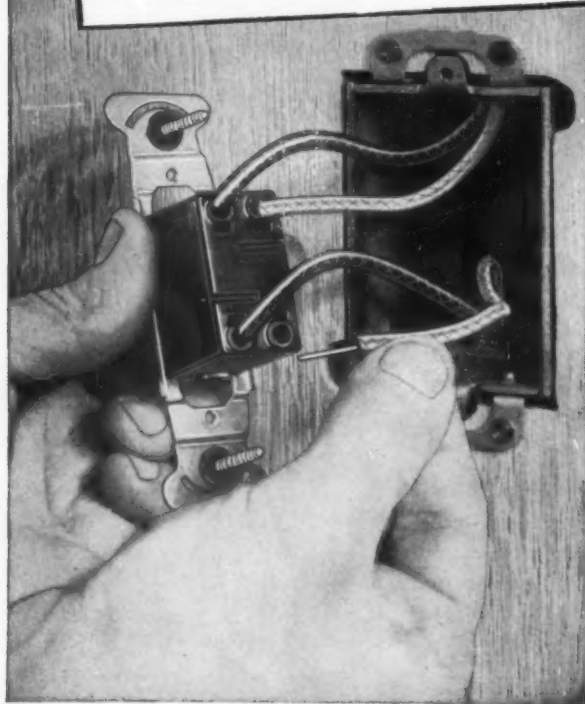


### NOW OFFERS

INTERCHANGEABLE  
and Junior  
*Quiette*  
SWITCHES

WITH  
SCREWLESS  
WIRE-LOCK  
TERMINALS

### WIRE-LOCK TERMINALS SAVE TIME and MONEY!



#### EASY TO WIRE

Both the JUNIOR and the INTERCHANGEABLE QUIETTE SWITCHES are equipped with Arrow-Hart's screwless WIRE-LOCK terminals to speed up your jobs and save you time and money. Just strip off insulation to the length shown on the gage, insert the conductor into the terminal hole in the back of the switch . . . and that's all. The wire is securely locked in for a positive electrical and strong mechanical connection.

#### EASY TO RELEASE

##### RELEASE IS EASY WITH YOUR "KEY TO PROFIT"

The "Key To Profit" or a small screwdriver depresses the clamp spring and unlocks the conductor for quick release. No time-consuming looping of heavy wires, no splicing, no soldering or taping.

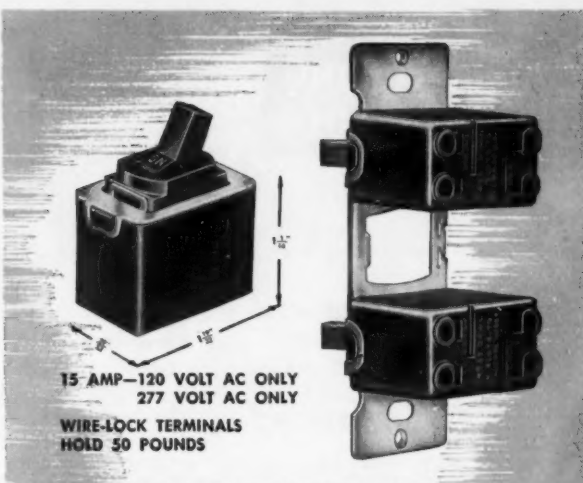




# NEW INTERCHANGEABLE Quiette SWITCH

The small, compact INTERCHANGEABLE QUIETTE SWITCH saves time, material, money. Screwless WIRE-LOCK terminals cut installation time, eliminate looping of wires. A special line feed thru shunt in single pole models means no extra wires needed; soldering, splicing and taping eliminated. It's rated at 277 volts to handle highly inductive load characteristics of fluorescent lighting jobs.

**NO NEED TO DERATE THIS INTERCHANGEABLE SWITCH** that gives quiet, mechanical operation

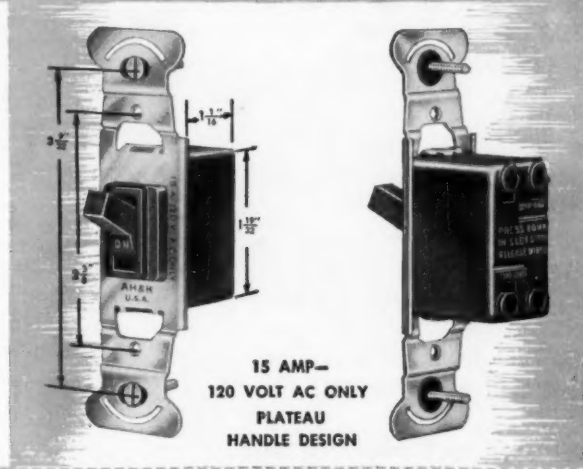


- Single or Double Pole, 3-Way or 4-Way
- Brown or Ivorylite
- Continuous Operation in any Position
- Positive Electrical Connections
- Quick Easy Wiring - Easy Wire Release

- No Mercury or other fluids
- Silver Alloy Contacts
- Strong Mechanical Connections
- Takes No. 14 or No. 12 Wire
- Underwriters' Laboratories Approved

# NEW Junior Quiette SWITCH

The JUNIOR QUIETTE SWITCH for residential use in homes—and motels—is designed for users and contractors. Each job's more profitable because each job goes faster. Compactness gives more working room; WIRE-LOCK terminals and box screws supported in base plate by fibre washers save installation time. Your customers will like the quiet operation of the JUNIOR QUIETTE SWITCH and the "plateau" handle design that gives beauty to their homes and keeps out dust by fitting snugly into wallplate opening. A ground feed thru shunt in single pole models saves you splicing, soldering and taping.



WRITE FOR "NEW QUIETTE SWITCHES" FOLDER COMPLETE WITH ORDERING INFORMATION FOR JUNIOR, INTERCHANGEABLE AND LIFETIME QUIETTE LINE.



THE ARROW-HART & HEGEMAN ELECTRIC CO.  
103 HAWTHORN STREET, HARTFORD 6, CONN., U.S.A.

Please send me the following:

☐ "NEW QUIETTE SWITCH" Folder.

NAME \_\_\_\_\_

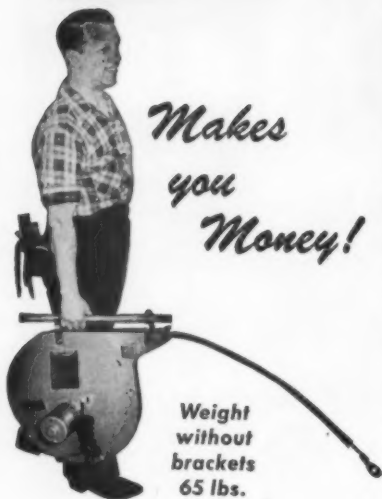
POSITION \_\_\_\_\_

COMPANY \_\_\_\_\_

CO. ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_ ECM \_\_\_\_\_

## THE ONLY COMPLETE WIRE-PULLING POWER TOOL



## ONLY ONE SETUP IS NEEDED!

**PUSHES** 45 Ft. of fish tape per min.  
**PUSHES** around five 90° bends.  
**STOPS** automatically if obstructed.  
**PUSHES** 175 Ft. of .060" x 1/4" usable highest quality tape.  
**MAY BE USED** in any position.  
**INDICATOR** shows how many feet of tape is pushed into conduit.

\*\*\*

**PULLS** 17 Ft. per minute, full load.  
**PULLS** 1200 Lbs. (equals pull of 8 men).  
**PULLS** wire in 3/4" to 2" conduit.  
**OPERATES** on 115 Volt AC or DC Current.  
**RUGGED**, Heavy Duty Construction.

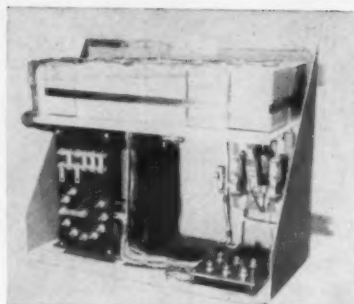
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**SAFE!** The fish tape is always in the conduit or in the tool . . . never free to come in contact with moving machinery, bus bars, live wires, etc.

**AVAILABLE THRU YOUR NEAREST** General Electric Supply Co.  
Graybar Electric Co.  
Westinghouse Electric Supply Co.

The **BARTH**  
CORPORATION

12652 BROOKPARK RD., CLEVELAND 29, O.

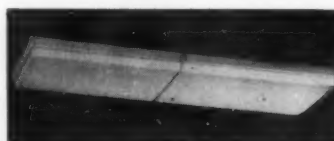


### Converter

(14)

For operation of 3-phase loads from single-phase lines, the "Add-A-Phase" static phase converter provides a balanced current output. Unit provides true 3-phase power with 120 degrees of displacement between any two of the phases, eliminating excessive and unbalanced current loads in motors supplied by the unit. Converter enables operation of 3-phase variable-speed or 2-speed motors from a single-phase source, limits inrush currents which cause light flicker. Converters are designed for a range of motors: 3-phase, 60-cycle, 220-440 volt NEMA Class A, B, C, D, E; 3-phase, 60-cycle, 220 volt, 2-speed, 4-speed and variable speed; sizes 1, 1 1/2, 2, 3, 5, 7 1/2, 10, 15, 20, 25, and 30 hp.

System Analyzer Corp., 700 West State St., Nokomis, Ill.



### Lighting Fixture

(15)

A new Plexiglas flush and recessed ceiling unit, known as "Neva-Glare", has been added to this line. Ophthalmically designed to diffuse light evenly with a minimum of light absorption. Fixtures are made to blend into ceiling line with no disturbing contrasts between fixture, ceiling and wall, and are easily removed for cleaning and maintenance. Units are for 2, 4 and 6 lights. Catalog is available.

Marlow Lights, Inc., Fanwood, N. J.

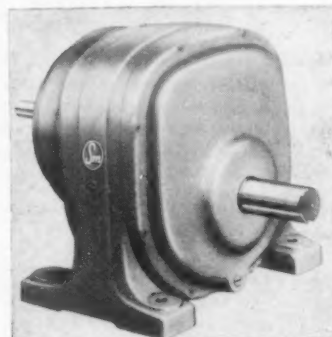
### Timing Device

(16)

A new motor-driven timing device that provides two separate timing circuits for start and stop cycles that operate independent of each other irrespective of automatic reset. It was designed for the variety of timing situations encountered by Autocon in industrial, municipal and processing control system applications. This new Motorelay is normally field adjustable over a range of 20-165 seconds for both "start" and "stop" time delay. Unit consists of a continuously running synchronous motor, appropriate reduction

gearing, a solenoid-operated clutch controlled by the pilot circuit, a cam shaft containing an adjustable cam for each of two circuits, and a load relay which is energized and de-energized by two micro-switches, activated by cams.

Automatic Control Company, 995 University Ave., St. Paul 4, Minn.

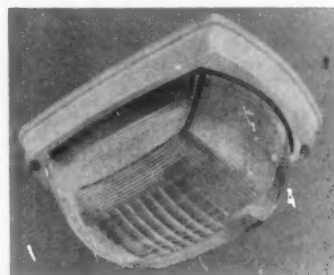


### Speed Reducers

(17)

A new line of multi-mount reducers which simplifies application to all machinery or equipment combinations. Each type can be mounted, without modification, on floor, wall or ceiling, with shaft horizontal or vertical. Ample lubrication is provided and multiple mounting is made possible by the Dip-and-Splash system. Gears always run in a liberal bath of oil sealed in the gear case which acts as the oil reservoir. Plugs are located for easy, quick filling, drawing and maintenance of proper oil level. A twin lubrication system is provided for triple reduction multi-mount units. Reducers are available in a variety of mounting types—with feet or footless, face or flange mounted and in a wide range of hp ratings and speeds. Bulletin No. 186 is available.

Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif.

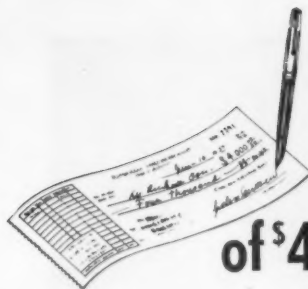


### Lighting Unit

(18)

New C-824 luminaire for corridor areas provides glare-free lighting. Its "three-dimensional" control sends useful light in all directions—up to the ceiling and across to the walls, as well as down to the floor. Reflections from these surfaces result in balanced illumination with high visibility. It has a prismatic glass refractor bowl. Specification sheet is available.

Holophane Company, Inc., 342 Madison Ave., New York 17, N. Y.



## would your customer turn down a savings of \$4,000 on a \$40,000 lighting expenditure?

Your customers can enjoy the benefits of the *finest* lighting money can buy and effect really substantial savings at the same time, simply by buying the *right* lighting fixture. Time and again, the better design and efficiency of Smithcraft Fluorescent Fixtures result in *fewer units* to produce recommended lighting levels.

Here's an actual case history of how a Pennsylvania department store saved 10% in initial costs and 10% in operating costs ... or approximately \$4000 on a ten-year \$40,000 expenditure.

Before re-lighting, a complete survey was made and exact lighting requirements were established. To meet these requirements, Smithcraft units and units of several nationally-known top quality

manufacturers were subjected to an exhaustive *comparative* analysis. Here are the results:

### 10% FEWER UNITS REQUIRED

Number of units required to achieve recommended lighting levels: ..... Smithcraft—**270**  
2nd Best Fixture—297  
3rd Best Fixture—339

### 10% LESS INSTALLATION COST

Proportionately less labor and materials were required to install the 270 Smithcraft units than the 297 units of the nearest competitor.

### 10% FEWER LAMPS

(Initial & Replacement)

Lamps required: ..... Smithcraft—**706**  
2nd Best Fixture—776  
3rd Best Fixture—914

Recommended practice is to replace lamps every 18 months—a continuing 10% savings.

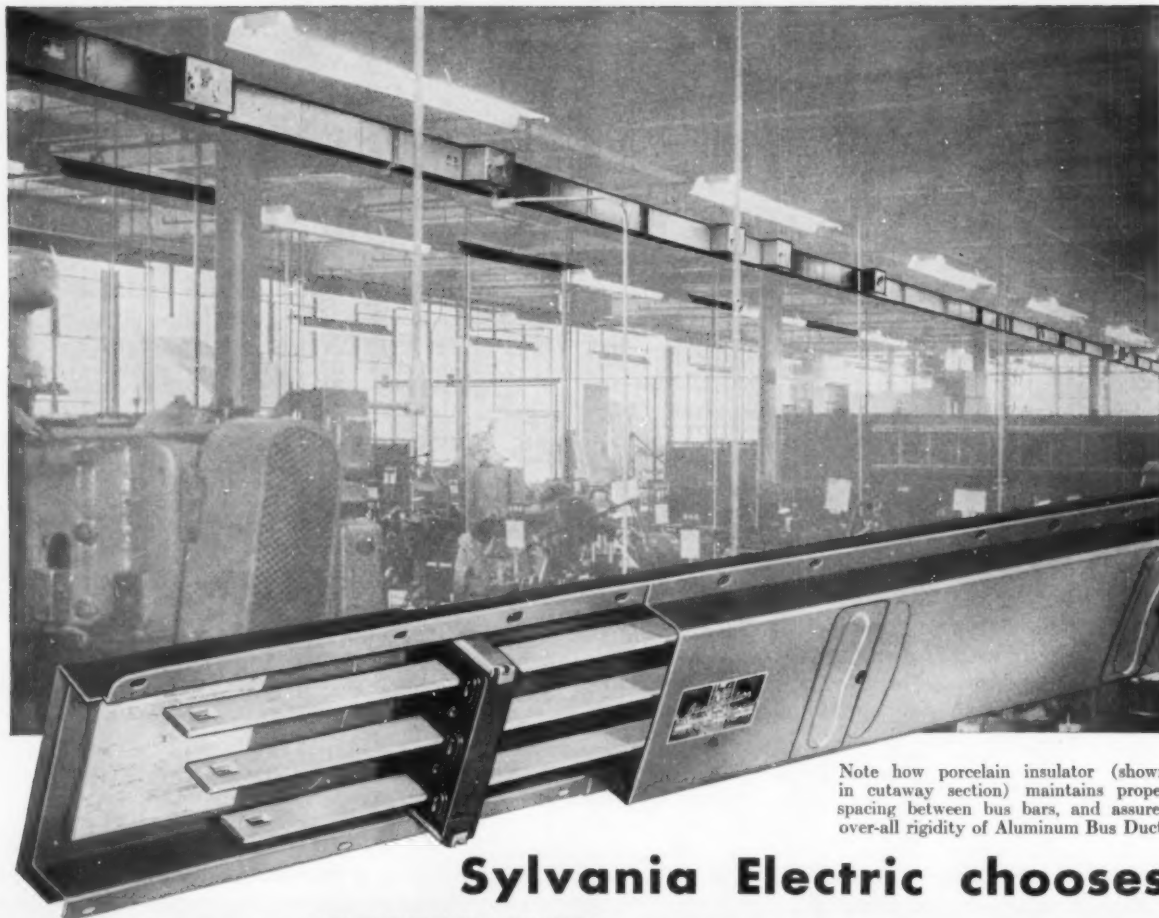
### 10% LESS POWER CONSUMPTION

Required wattage: ..... Smithcraft: **51.3** kilowatts  
2nd Best Fixture: 56.3 kilowatts  
3rd Best Fixture: 64.8 kilowatts

Whether you're lighting a store, office, school, factory, or institution, it pays to *buy lighting—not fixtures*. Invest in Smithcraft—America's Finest Fluorescent Lighting Equipment.

PHOTOGRAPH SHOWS AN INTERESTING PATTERN ARRANGEMENT OF THE SMITHCRAFT LOUVERLITE SLIMLINE IN THE PENNA. DEPT. STORE DESCRIBED ABOVE.





Note how porcelain insulator (shown in cutaway section) maintains proper spacing between bus bars, and assures over-all rigidity of Aluminum Bus Duct.

## Sylvania Electric chooses BULLDOG ALUMINUM BUStribution® DUCT

**Sylvania Electric**—a company with many years of experience in the electrical field—was one of the early users of Bulldog Bus Duct with lightweight aluminum conductors. Bulldog Aluminum BUStribution Duct has provided Sylvania's plants with low-cost power distribution, and has enabled them to meet expanding production requirements.

**Illustrated above** is an installation of flexible Bulldog Aluminum Plug-In Duct feeding lights and machines at Sylvania's York, Pa. plant. In its new electronics laboratory and production plant in Mountain View, Calif., Sylvania installed a 600-foot run of Bulldog Aluminum Plug-in Duct, and materially reduced the ceiling truss load. The combination of lightweight aluminum duct and the patented Bulldog

scarf-lap joint meant faster, easier installation at less cost.

**Operating costs are low, too.** And relocation is accomplished with the same speed and economy as the original installation. Stocking accessory parts is simplified because the aluminum duct systems are completely interchangeable with other Bulldog systems. This is important to those companies with many existing BUStribution installations.

**Bulldog Aluminum BUStribution Duct** (LO-X® Duct for feeder and welder circuits, and Plug-In Duct for branch circuits) is listed by Underwriters' Laboratories, Inc. For complete information, consult your local Bulldog Field Engineer. Or, write: Bulldog Electric Products Company, Dept. EC-47, Detroit 32, Michigan.

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THOROUGHNESS IN ELECTRICAL EQUIPMENT

Export Division:  
13 E. 40th Street  
New York 16, New York

In Canada:  
Bulldog Electric Products Co. (Canada) Ltd.  
80 Clayson Road, Toronto 15, Ontario

# BULLDOG

ELECTRIC PRODUCTS COMPANY

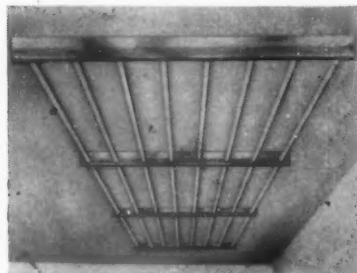




**Fittings (19)**

New 90° pull-in ells and 90° pull-in adapters are furnished with gasketed covers, made of malleable iron and cadmium plated. They may be used either to convert a straight box connector into a 90° connector or as a 90° box connector for rigid standard pipe coupling. They permit a straight pull in both directions. Ells have female threads at both ends; adapters have male threads at one end and female at the other.

*Genecy Electric Company, RKO Building, Radio City, New York 20, N. Y.*



**Lighting System (20)**

A new lighting system, called the "Salesliter" is for installation in stores. Designed for slimline lamps, it gives the effect of row after row of lamps without lampholders or housings. In addition, units may be laid out continuously so that long lines of lighting are created. It is easy to clean and maintain due to its simplicity. Any electrical component is quickly and easily serviced without disturbing the installation itself.

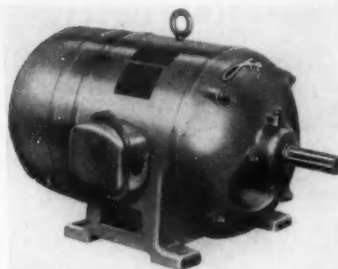
*Smithcraft Lighting Division, Chelsea 50, Mass.*

**Capacitors (21)**

Newly-designed capacitors for air conditioners, that can individually provide power factor correction of two single capacitors of the same voltage ratings. They can be applied wherever electrical circuits in air conditioners are designed for two running capacitors and a method of switching. Enclosed in solderless, drawn-oval, steel cases, the units are composed internally of low-loss Kraft paper and dead-soft annealed aluminum foil impregnated with Pyranol dielectric. Two

types of bushing terminals are available on the dual-section capacitors: fork terminals and quick-connect (solderless) terminals. Each unit has three bushings, one of which is common to both sections. The capacitors are available in voltage ratings of 236, 250, 330 and 440 volts ac with selective microfarad ratings.

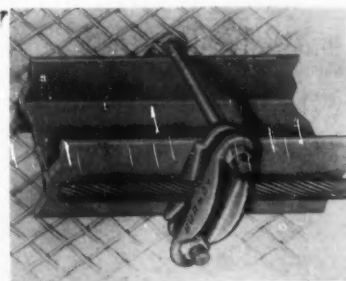
*General Electric Company, Schenectady 5, N. Y.*



**Brakemotor (22)**

Short overall length is one of the features of the new integral brakemotor. Shorter length is made possible by utilizing the motor end bracket as an integral part of brake. Units utilize disc brakes and are available in NEMA motor frame sizes from 203 to 326. Brakes are designed to furnish maximum continuous duty torque from 3 ft.-lb. in the smaller sizes to 50 ft.-lb. in the largest sizes. An external wear indicator shows that brake is operating properly at each engagement. Brake adjustment is simplified. Other advantages include rugged construction with cast iron external parts for ability to stand up in severe service; dependable brake lever system; maximum solenoid-gap limit; and extra electrical protection. Bulletin No. 1550 is available.

*Louis Allis Co., Milwaukee 7, Wis.*



**Grounding Clamp (23)**

A new grounding clamp, type GA-H for H-beam fence posts. Clamp, of high copper alloy, designed with slots in casting to allow lateral movement of bolts, permitting installation of different H-beam widths, accommodates H-beam fence posts from 1½ by 1½ to 2½ by 2½. Bolt heads are recessed. GA-H takes a conductor range of No. 4 solid through 250 MCM copper cable.

*Burndy Engineering Company, Inc., Norwalk, Conn.*

# THOUSANDS OF PLANTS NOW GETTING THOUSANDS OF SPEEDS



## Miracle Motor ANY RPM BY DIAL CONTROL

Get more production out of your present machines by powering them with U. S. Varidrive motors. No extra space required. Thousands of plants are profiting with this miracle motor. Turning a simple control handle changes speed of the Varidrive to any desired r.p.m. in ratios up to 10:1. Operators can instantly select the speed best suited for the work.

### ALL-IN-ONE PACKAGE

Occupies little more space than a single speed motor. ¼ to 50 hp, 2 to 10,000 r.p.m.

# U.S. VARIDRIVE

*Mail Coupon for  
New 16-pg. Booklet*

#### REQUEST FOR VARIDRIVE BOOKLET

U. S. ELECTRICAL MOTORS Inc. EC-9  
Box 2058, Los Angeles 54, Calif. or Milford, Conn.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# The CLARK Line now includes SERVICE ENTRANCE EQUIPMENT



**American**

ELECTRIC SWITCH DIVISION

General Purpose Switches  
Fuse Pullout Service Entrance Switches  
Fuse Pullout Main-Range-Lighting  
Combinations  
Door Pullout Service Entrance Switches  
Toggle Type Service Entrance Switches  
Fuse Cabinets and Branch Circuit  
Attachments  
Outdoor Safety Switches  
Outdoor Service Entrance Switches  
Fused Lighting Panelboards  
Dead Front Distribution Panels  
Magnetic Circuit Breaker Panelboards  
Quicklag "De-ion" Panelboards  
Nofuze Lighting Panelboards

The manufacturing facilities of the American Electric Switch Corporation have been acquired by the Clark Controller Company, and American is now a division of Clark.

The integration of these two organizations, each with more than 25 years experience in the manufacture of high quality electrical products, combines a wealth of engineering know-how, production and service facilities. American equipment now becomes an important part of the Clark line.

## Increased Availability

Large factory stocks, complete stocks in strategically located warehouses, plus stock on shelves of distributors throughout the country, now assure availability of this equipment for fast, efficient delivery.

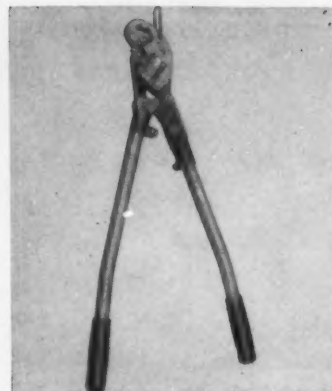
*Write for complete  
descriptions and list  
prices*

**The CLARK**  
ENGINEERED  
ELECTRICAL CONTROL



**CONTROLLER Company**

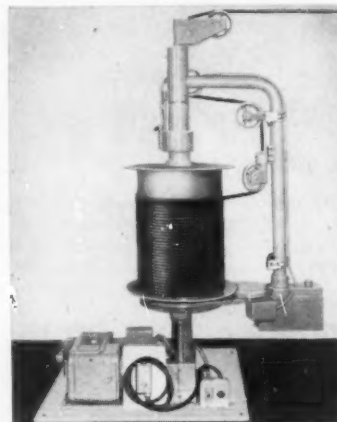
1146 E. 152ND ST., CLEVELAND 10, OHIO



**Connectors and Tool (24)**

A complete line of compression-applied distribution and service connectors, together with a new hand tool for installing them, has been introduced. The line features a square-shaped compression for all joints including those for steel corewire of A. C. S. R. The entire line is installed with the new UT-5 tool, which weighs five pounds. Range of conductors accommodated includes: No. 8 stranded to No. 2 stranded and solid copper; No. 6 solid to 2/0 stranded aluminum; and No. 6 to 1/0 A.C.S.R. Connectors installed with the tool cover A.C.S.R., copper and aluminum tension splicers, loop splicers; as well as service splicers from aluminum to copper.

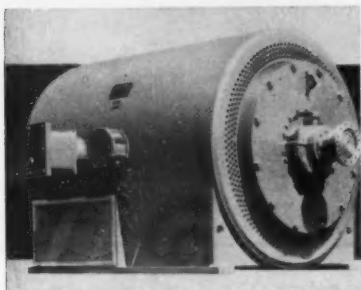
Thomas & Betts Co., 36 Broad St., Elizabeth 1, N. J.



**Cable Reel (25)**

A new cable reel on which any diameter of electrical cable can be wound without disconnecting cable ends or using slip rings or other types of sliding contacts. Unit, called "Connectoreel", is motorized, has a variable speed drive and level wind mechanism that is power driven and automatically reversible. It is available in either a horizontal or vertical model. All metal parts are treated to resist corrosion. It can be supplied without power, as it will operate from existing power sources, if required, either in plant or on mobile equipment.

Rodon, Inc., Neshaminy, Pa.



**Motor**

**(26)**

A 1250-hp, 2300-volt, 1780-rpm explosion-proof motor (Type ANZZ) has been approved by Underwriters' Laboratories for operation in Class I, Group D hazardous locations. Ratings up to 800 hp, 3600 rpm have previously been approved for Class I, Group D, and Class II, Group F and G hazardous locations. The explosion-proof design is a modification of the company's totally-enclosed, fan-cooled motor line with tube-type air-to-air heat exchangers. It meets the requirements of industries in which explosion-proof drives must be specified.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.



**Vice Stand**

**(27)**

A new portable power drive for hand pipe tools called the No. 432 "Lightweight Champ" power vise stand. Capacity is  $\frac{1}{2}$ -in. to 2-in. pipe and up to 8-in. pipe when hooked up to a geared drive shaft. In addition to driving die-stocks, pipe cutters and reamers, the No. 432 can be used to turn up or back-off fittings. Can also be furnished with attachment for bar twisting. Features include streamline construction, lighter weight, more powerful motor, unbreakable steel welded case, two driving arms on center line with spindle and wrenchless front chuck that insures "No-Slip" grip in both right and left hand direction.

Oster Manufacturing Co., 2057 East 61st Place, Cleveland 3, Ohio.

**Fluorescent Lamp**

**(28)**

New rapid-start, 8-foot fluorescent lamp can produce light at 70 lumens per watt. Its approximate initial brightness is 2,560-foot lamberts. Lamp is of a stand-

## BIDDLE Instrument News

**Bulletin  
21-20**

**New**

**MEGGER®  
INSULATION  
TESTERS  
5,000 and  
10,000 VOLTS**

Complete presentation of Megger® line of Insulation Resistance Testers. Featuring new high range motor-driven and rectifier-operated testers. One model with a range up to 100,000 megohms at 5,000 volts. Another model with a range up to 200,000 megohms at 10,000 volts.

**Manual  
21-J**

**New**

**INSTRUCTION  
MANUAL for  
MEGGER®  
INSULATION  
TESTERS  
(Fifth Edition)**

Nearly 80,000 of the previous copies have been distributed to electrical men and educators throughout the U.S. Now expanded to 100 pages, the new Instruction Manual 21-J devotes 14 chapters to a complete education for the practical man who is responsible for electrical equipment.

**Bulletin  
66**

**New**

**BIDDLE  
CORONA  
TESTING  
EQUIPMENT**

Describes three models for non-destructive evaluation of electrical insulation for testing transformers, cables, capacitors and other electrical components for ionization starting voltage at 60 cycles.

**Bulletin  
80**

**New**

**BIDDLE  
MOTOR  
and PHASE  
ROTATION  
TESTER**

Describes instrument for determining direction of rotation of electric motors before they are connected to the line. Also, to determine phase rotation or sequence of energized power circuits.

**Bulletin  
22**

**New**

**BIDDLE  
DIELECTRIC  
TEST SET**

Describes Model 1-40 KV for measuring d-c current at voltages up to 40 KV when applied to the insulation of such equipment as generators, transformers, bushings and cable.

**Bulletin  
65**

**New**

**BIDDLE  
IMPULSE CABLE  
FAULT  
LOCATING  
EQUIPMENT**

Describes three models of cable fault locating transmitters now available. Also describes detector and accessory equipment.

**YOU MAY HAVE ONE OR ALL WITHOUT CHARGE**

**JAMES G. BIDDLE CO.**

• ELECTRICAL TESTING INSTRUMENTS  
• SPEED MEASURING INSTRUMENTS  
• LABORATORY & SCIENTIFIC EQUIPMENT

**1316 ARCH STREET  
PHILADELPHIA 7, PA.**

Please mail me: ☐ Bulletin 21-20 ☐ Manual 21-J ☐ Bulletin 66  
☐ Bulletin 80 ☐ Bulletin 22 ☐ Bulletin 65

Name

Job

Company

Address

BA29-CCM

*Proven*

On loads *UNDER* 600 Amps . . . .

## **Fusetron dual-element Fuses Have an Interrupting Rating in Excess of 100,000 Amps.**

An interrupting rating in excess of 100,000 amperes for FUSETRON dual-element fuses . . . this was shown by tests that were conducted under conditions that simulated the most severe field conditions. These tests were witnessed and verified by the Electrical Testing Laboratories of New York.

The test circuits were set to deliver far in excess of 100,000 amperes — yet the 250 and 600 volt FUSETRON fuses cleared the shorts without igniting readily flammable material placed around the fuses . . . and there was comparatively little noise.

These tests show that Fusetron fuses, even in the small 30 ampere range, can interrupt safely the most severe available short circuit current.

### **No interference with time-lag**

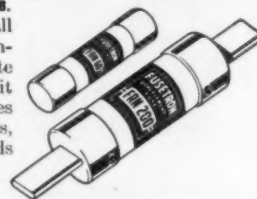
Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses. Even

though the interrupting capacity has been greatly increased, the time-current characteristic of Fusetron fuses has in no way been disturbed.

### **ALL THIS ADDED SAFETY**

without changing a panelboard or switch . . . plus 10 point Protection of FUSETRON dual-element FUSES!

1. Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give double burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.



### **Fusetron Fuses Help eliminate needless Shutdowns for Production Engineers.**

Work stoppages caused by needless blows are prevented. Even if all the motors on a circuit start at one time or other harmless overloads occur, the fuse link holds to prevent a shutdown.

Likewise, Fusetron fuses guard against needless blows caused by excessive-heating in panelboards and switches—lesser resistance results in cooler operation.



### **Fusetron Fuses Offer Maximum Safety for Electrical and Safety Engineers.**

With an interrupting rating of 100,000 amperes, Fusetron fuses give the greatest possible protection against damage due to short-circuits. And just as important, they reduce the hazard of

motor burnouts due to single phasing and overloading.



### **Fusetron Fuses Save Time and Work for Maintenance Engineers.**

Once properly installed, Fusetron fuses require no costly inspection time or down-time for calibration and other maintenance necessary on mechanically operated devices.

Unnecessary repair work on motors is avoided because Fusetron fuses reduce to a minimum the danger of damage due to electrical faults. If trouble occurs, instead of rewinding or replacing burned out motors, simply replace Fusetron fuses.

Switches and panelboards are protected against damage from poor contact heating.

Fusetron fuses also protect against needless blows that cause irritating interruptions of regular maintenance.



*Proven*

On loads *ABOVE* 600 and up to 5,000 Amps.

## **BUSS Hi-Cap Fuses Have an Interrupting Rating In Excess of 100,000 Amps. . . and their blowing**

*time can be coordinated with that of Fusetron fuses.*

An unlimited interrupting rating for BUSS Hi-Cap fuses on any voltage up to 600 . . . this was confirmed by tests reported by the Electrical Testing Laboratories of New York.

BUSS Hi-Cap fuses are designed to give protection against dangerous overloads as well as high fault currents — yet retain the speed of operation necessary to limit heavy short currents to safe values.

When coordinated properly with Fusetron dual-element fuses they will not open ahead of the fuse nearest to the fault — thus the trouble is isolated to the part of the circuit in which the fault occurs.

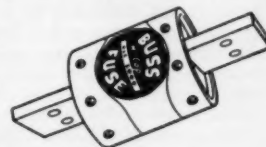
### **Added SAFETY on Old Installations**

On installations where the increase in the capacity of the circuit has outgrown the inter-

rupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of bad fault.

### **ACTION THAT SAVES YOU MONEY**

Don't risk losses. Delay may cost you far more than replacing every fuse with a FUSETRON fuse. By passing the word along that all purchase and stock records should call for FUSETRON dual-element fuses on loads up to 600 amperes — and BUSS Hi-Cap fuses on loads above that, you get action that begets money saving.



*On New Construction* tell your architect to specify this Safer, Better Protection.



### **Fusetron Fuses Cuts Cost for Top Management.**

**Cuts maintenance cost** — Fusetron fuses are maintenance free.

**Cuts motor repair cost** — Fusetron fuses guard the motor, against damage due to overloading, single phasing, short circuits and other electrical faults.

**Cuts production costs** — Shutdowns due to needless blows are eliminated.

**Cuts new installation costs** — Smaller sizes can be used, therefore big savings can be made on switches and panelboards.

**Cuts present installation costs** — Fusetron fuses hold and won't open on starting currents so the need for larger panelboards and switches is often eliminated — and in many cases new motors can be added to the circuit without installing larger panelboards or switches.

## **Play Safe—Install Fusetron Fuses and BUSS Hi-Cap Fuses now!**

For blowing time charts or more information on FUSETRON fuses and BUSS Hi-Cap fuses use coupon or write for bulletin FIS and HCS.

**FUSETRON**

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

**BUSS**

BUSSMANN Mfg. Co.  
(Division of McGraw Electric Co.)  
University at Jefferson, St. Louis 7, Mo.  
Please send me complete facts about FUSETRON dual-element fuses and BUSS Hi-Cap fuses.

Name

Title

Company

Address

City & Zone  State  ECM-9-54

ard cool white color, with other colors to follow. Rated life on 3-hour cycle is 7,500 hours. Lamp has been designed for and will work best in well ventilated fixtures, either of industrial or commercial types. It is not designed for fully enclosing fixtures, such as troffers. Technical data is: nominal watts 100; operating current (amps) 815; operating volts 140; bulb-T12; base—recessed double contact; approximate initial lumens 7,000.

*Sylvania Electric Products, Inc., Salem, Mass.*

### Circuit Breaker (29)

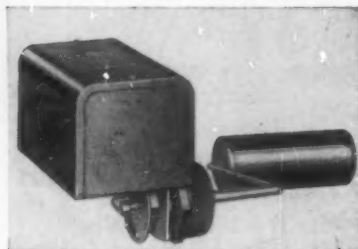
Circuit breaker has choice of time delays for close protection. Inverse time delay accommodates harmless overcurrent, although instant break is provided when current rating is 1000%. Manual 101 is available.

*Heinemann Electric Co., Plum St., Trenton 2, N. J.*

### Industrial Television (30)

New industrial television equipment known as "UtiliVue" closed circuit television. Series 400 "UtiliVue" camera can be used either with a Video monitor or with a standard TV receiver—can be tuned to any channel from 2 to 6. All controls and power supply are built into the camera. Voltage regulation is built in and the camera has automatic illumination compensation. Series 400 can be provided either with a Utilicon or with a Vidicon type pickup tube. Multiple receiving points can be fed. Bulletin No. 1175 is available.

*Diamond Power Specialty Corp., Lancaster, Ohio.*



### Alternator (31)

A new screw-in tank attenuator for condensate pumps has been designed. It provides positive means of mechanically alternating the operation of two pumps installed in a duplex system with a common tank. New Class 9038 CG alternator is interchangeable in tank mounting with Class 9037 Type HG screw-in tank float switch. It is possible to change the float position from the right to the left hand side or vice versa. Contacts may be converted to either open or close on liquid rise. Switches are available for 110, 220, 440, and 550 volts. Structure consists of two 2-pole, double break, silver-to-silver, visible and vertical contact mechanisms. It is of the positive snap

action toggle type, assuring operation under conditions of liquid turbulence. Enclosure consists of a steel frame with a slip-on steel cover finished in blue-gray enamel and built to NEMA I specifications. A water tight seal is insured by a graphite coated asbestos, used in stuffing box.

*Square D Company, 4041 North Richards St., Milwaukee 12, Wis.*



### Motor Protector (32)

The Mini-Breaker motor protector can be used in a cut-out base wired to any motor or electrical equipment to safely interrupt excessive overloads and short circuits. It trips instantly on "shorts" but has a built-in time lag to handle temporary starting loads and line surges. Service can be restored within ten seconds after an interruption by pressing in the shock-proof reset button. Available in 4-, 4½-, 5-, 5½-, 6- and 7½-amp ratings. Designed primarily as a protective device for motors, it can also be used on home appliances, electronic equipment and other electrical installations. Literature is available.

*Mechanical Products, Inc., 1800 River St., Jackson, Mich.*

### Welder and Standby Unit (33)

A new combination welder and auxiliary or standby power unit, called Weldan-power, for maintenance work in building, construction, business and industry. It is rated as a 200-amp welder and a 4 kva continuous duty power unit. For intermittent standby power, it is rated at 5 kva. For business and industrial use the machine supplies a wide range of ac current for maintenance welding to repair equipment breakdowns, repair worn parts, hardface machine parts to resist wear, make replacement parts, build special equipment, fabricate bins, containers, conveyors, etc. It also supplies 230/115-volt, 60 cycle single phase ac standby power to operate grinders, drills, power tools, pumps, saws and lights. Contractors can use it for power tool operation, emergency lighting and general maintenance welding. Farmers can use it for emergency or auxiliary power and for welding. Unit is an ac alternator powered by a 12 hp air-cooled gasoline engine.

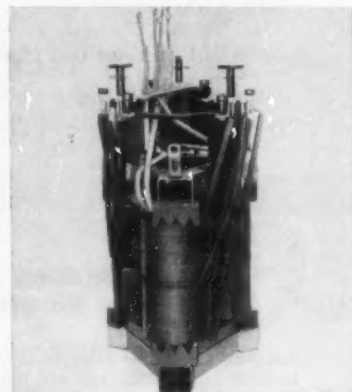
*Lincoln Electric Company, Cleveland 17, Ohio.*



### Safety Ladder (34)

A versatile work truck with a "high altitude" extension shelf and safety ladder. It gives the operator a reach potential of 12 feet. The 5-step ladder slides through the guides when the workman steps on it until its rubber feet rest solidly on the floor. This locks truck and ladder to the floor as a unit. Ladder has curved handles to lean against on sides and a front bar which forms a brace to steady the knees. Stepping down and off the ladder automatically releases it, and it springs back to its "up" position. Removable shelves on truck make it adaptable for carrying tall cartons or large packages. This truck-shelf-ladder assembly is made of aluminum.

*Rol-Away Truck Mfg. Co., Inc., 6143 S. E. Foster, Portland, Ore.*



### Transformer (35)

A new three-phase transformer, designated Tri-Wound, is available in sizes 9 through 75 kva and in standard primary voltage ratings through 13,800 volts in the delta-delta, delta-wye, or wye-delta connections. Many features of the single-phase round-wound are retained in the Tri-Wound, including uniformly high impulse level, low exciting current, high short-circuit strength, and overload capacity. The new Tri-Wound design incorporates a wound core that is common to all three coils.

*Line Material Company, Milwaukee 1, Wis.*

# Bulletin

In the next issue of this magazine, Day-Brite will announce the greatest development in industrial lighting ever to reach the market—the new CFI\* INDUSTRIAL LIGHTING FIXTURES.

The revolutionary new CFI-25 and the new CFI-10 will offer you the most advanced industrial lighting equipment ever engineered and built. Important new features promise a lifetime of satisfaction and unparalleled performance.

This bulletin has but one purpose: to alert you to the industrial lighting value of your lifetime. Look for Day-Brite's announcement of the sensational new CFI in these pages next month.

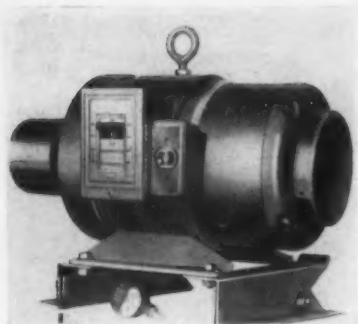
# Day<sup>®</sup>Brite

Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo.  
In Canada: Amalgamated Electric Corp., Ltd.,  
Toronto 6, Ontario

\*Lifetime Comfort For Industry



489



**Generating Plant (36)**

Model 5VB-4M is a 5,000 watt, 60-cycle, ac generating set powered by the new Model "VB" engine. It supplies multiple voltages (1 and 3-phase), with voltage regulation within 4%. This 5-kw, skid-mounted unit meets all specified test requirements for Military Type II, Class A engine generating plants. It is built to withstand braking and dropping shocks, to resist high humidity, to start and operate at extreme temperatures and will perform at all angles up to 15° from horizontal. It is also available with dc output up to 7½-kw in standard voltages.

D. W. Onan & Sons, Inc., Minneapolis, 14, Minn.



**Paging System (37)**

New industrial paging system combines sound paging with two-way intercommunication. It permits roving personnel to be located in seconds, and enables them to answer a page call immediately, from any point in the building. System consists of any required number of handset stations, either wall-mounted or desk-type; re-entrant, trumpet-type industrial reproducers; and a control rack which provides amplification and communication facilities for the entire system. Wall-mounted handset stations are equipped with paging button for originating calls over all reproducers in system, telephone-type handset, retractable coil cord, and heavy-duty cradle switch. Desk-type handset station is designed for use within an office or enclosure. Incoming paged messages are reproduced through speaker grille on this station, equipped with combination on-off switch and four-step volume control knob. Trumpet-type re-

producers are 21-in. long with 20-in. bell diameter, and provided with adjustable bracket for wall, ceiling or pillar mounting. In hazardous areas, explosion-proof trumpets can be installed. A relay-controlled amplifier and other electronic components for paging and intercom are located in control rack which stands 66½-in. high, 22½-in. wide, and 16½-in. deep.

Executone, Inc., 415 Lexington Ave., New York, N. Y.

**Emergency Light (38)**

A new Sentry-Lite, Model 200X, designed to provide instant automatic emergency light over large areas, if power is interrupted. Automatic recharger operating on standard electrical power keeps battery up to peak capacity. Unit measures 8- by 13- by 16-in. and weighs 50 lbs. including battery.

Hobby & Brown Electronic Corporation, 55 Front St., Rockville Centre, N. Y.

**Relay (39)**

This special ASCO control was designed specially for use in cooking schools, restaurants, institutions, etc., where gas-fired equipment is being used. The purpose of the control is to automatically shut off the flow of gas to the ovens, broilers, etc., should electrical power fail or drop below a minimum voltage level. A selenium rectifier on the relay panel converts ac to dc for the dc solenoid valve. All component parts are assembled within a NEMA IB No. 16 gauge flush type louvered cabinet, which measures 14½-in. high; 9¼-in. wide; 3¾-in. deep.

Automatic Switch Company, 391 Lakeside Ave., Orange, N. J.

**Cable Ripper and Wire Gauge (40)**

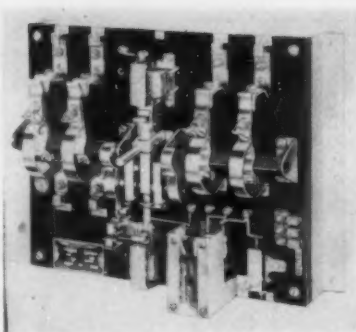
An improved tool for ripping the outer covering of non-metallic sheathed cable, including small type "T". Cable is slipped in, handles are squeezed together, then a pull cuts sheathing as far as desired. In case of long ripping, tool is designed with an offset end which cable slides by. Other improvements include long handles, cadmium plating; and stamped holes in handle to measure wire sizes from Nos. 14 to 6. Overall length is 5 inches.

Holub Industries, Inc., Sycamore, Ill.

**Electric Hammer (41)**

An electric portable rotary hammer with a detachable bit for horizontal and overhead drilling of reinforced concrete, masonry and similar materials. Model DL-375S hammer rotates at 100 rpm. Tool is powered by a heavy-duty 115-volt, 5-amp, ac-dc, 60 cycles or less Thor electric motor. It weighs 9½ pounds and is 15 inches long.

Demo Tool Corp., 0735 Melrose Ave., Los Angeles 46, Calif.



**Switch (42)**

New electrically operated transfer switch features mechanical locking action. Switch is especially adapted for use in hospitals, theatres, dance halls and other public buildings. Two coils are used to open and close the normal and emergency circuits—each coil operating by the source of supply to be controlled. Transfer from one source to another requires less than 1/25th sec. and may be effected automatically or by a manual pushbutton station. All contact arms and control lever are connected directly to a single insulated square shaft. A solenoid turns the shaft to operate the contact. Plunger operation connects directly to control lever, passes through a dead center and holds without any springs, latches or locking mechanism.

Zenith Electric Co., 152 W. Walton St., Chicago 10, Ill.

## Product Briefs

(43) Broan Manufacturing Company, Inc., Milwaukee, Wis., has announced a new line of 8-in. ventilating fans for residential use—two wall and two ceiling fans. . . . (44) A new Dyna-Switch designed to prevent overload damage to hoisting equipment has been developed by W. C. Dillon & Co., Inc., Van Nuys, Calif.

(45) Cable Quik-Lift electric hoists are now available from Coffing Hoist Company, Danville, Ill. . . . (46) The electronic speed control which has been developed at ERDCO Engineering Corporation, Addison, Ill., eliminates all radiation interference. . . . (47) A new series of Hi-Ranger extensible personnel towers has been placed in production by Mobile Aerial Towers, Inc., Ft. Wayne, Ind.

(48) A new resistance measuring instrument that combines the accuracy of a Wheatstone bridge with the operating speed and portability of an ohmmeter is manufactured in Vienna, Austria and distributed in the U. S. by the United Optical Manufacturing Corp., New York, N. Y. . . . (49) A new super deluxe fully automatic electric roaster-oven has been introduced by Nesco, Milwaukee, Wis. Capacity is 20-qt., uses 1320 watts, operates on 110-120 ac.

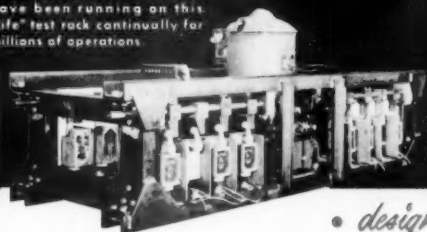
(50) A new dual expansion anchor manufactured by Wym Products Co., Inc., Cleveland, Ohio.



# NEW

## CLARK *Type DM* MACHINE LIMIT SWITCH

CLARK Type DM Limit Switches have been running on this "life" test rack continually for millions of operations.



*designed and built for dependability and longer life*

Our design engineers were given the assignment of developing a new heavy-duty machine limit switch to meet the exacting needs of modern industry. Primary requisites were dependability, accuracy, durability and versatility. They created a design that is rugged, simple and 100% functional. They selected materials for the working components that hold up indefinitely under the most severe punishment. They employed sound, mechanical principles

to provide positive, accurate, trouble-free operation, and added features to make the switch as nearly "fail-safe" as possible.

Pilot models were subjected to severe breakdown tests, and changes made as indicated. When our high standards for performance and durability were finally met, the initial production run was made. The first production units were placed on the test rack illustrated, and have been operating continuously ever since.



### THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152<sup>ND</sup> STREET, CLEVELAND 10, OHIO

See other  
side for  
further details

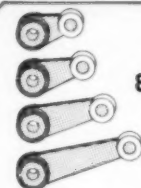
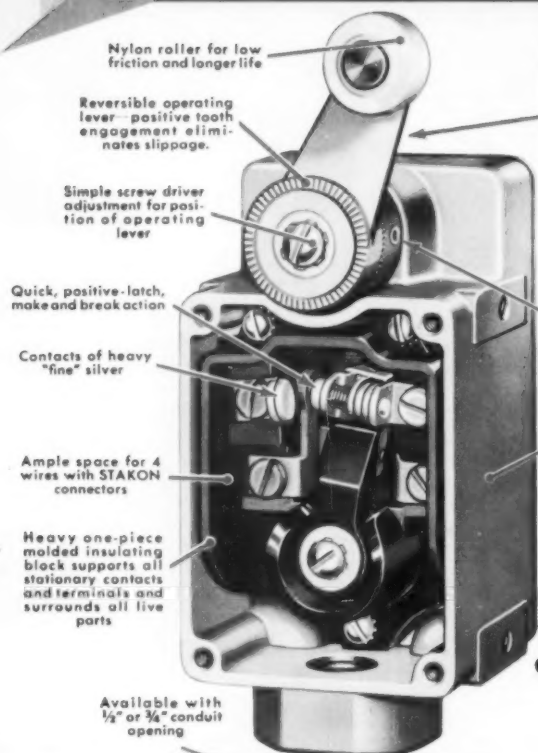




# CLARK *Type DM* LIMIT SWITCH

*built for* **RUGGED SERVICE**

**VERSATILITY • LONG LIFE • ACCURACY**



## OPERATING LEVERS 8 TYPES AVAILABLE FROM STOCK

Straight—4 sizes  
1",  $1\frac{1}{2}$ ", 2", 3"

Track  
Type

Planer  
Type No. 1

Planer  
Type No. 2

Shipper  
Rod

"Rollpin" assemblies  
are spring steel in  
compression

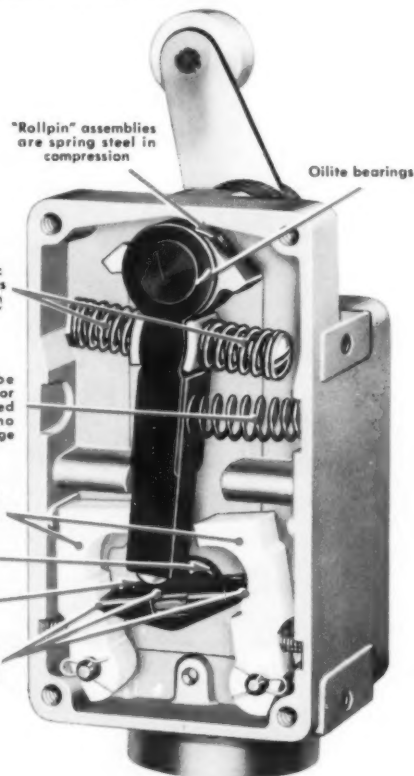
NEMA Type 3 dust-  
tight, oil-tight  
enclosure

• Areas subjected to arc  
deterioration protected  
with glass-melamine  
plates

• All springs are in  
compression

• Electrical and mechanical  
sides of switch are com-  
pletely isolated

CLARK Type DM LIMIT SWITCHES are simply built, with a minimum number of parts. They are designed for one purpose: to provide dependable, accurate, trouble-free operation for a long life. All latch and trip-bearing surfaces are nylon to steel for minimum wear. All springs are in compression for greatest safety—they cannot be overloaded.



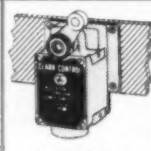
## REGULAR AND REVERSE LEVER TYPES

—can be mounted in any position

### REGULAR MOUNTING TYPES



SIDE MOUNTED

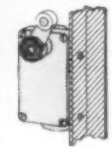


HORIZONTAL  
FLANGE PLATE



VERTICAL  
FLANGE PLATE

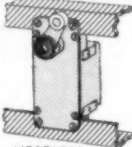
### REVERSE LEVER MOUNTING TYPES



SIDE MOUNTED



HORIZONTAL  
FLANGE PLATE



VERTICAL  
FLANGE PLATE

Six styles of back covers or mounting plates are avail-  
able for an infinite variety of mounting arrangements.

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Please send me Bulletin 102 DM describing the new CLARK  
Type DM Limit Switch.

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Insist on CLARK Type DM Limit Switches for more dependable,  
longer life operation on all your new machines and for replace-  
ment of unreliable or worn out switches on equipment now in use.

Send for 4-page descriptive bulletin giving full  
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# Catalogs, Bulletins and Engineering Data

(51) **ISOLATED PHASE BUS** increases safety, service continuity, and equipment protection on circuits with high short-circuit capacity. Booklet B-5906, covers available equipment for 15- to 69-kv service. Westinghouse Electric Corp.

(52) **MOTOR PARTS** renewal catalog for all makes of motors. Complete-Reading Electric Co., Inc.

(53) **OPERATION RECORDERS** provide a permanent record of mechanical or electrical process functioning. Bulletin OP1505 covers both round- and strip-chart units as well as suggested applications. Bristol Co.

(54) **BATTERIES** for control, switch-gear, and auxiliary power installations. Folder CP-536 and CP-537 include data on dimensions, ratings and construction of complete line of lead-calcium and lead-antimony batteries. C & D Batteries, Inc.

(55) **BURGLAR ALARM SYSTEM** employs ultrasonic sound at a frequency of 19,200 cycles per second. System will also detect fires or the rupture of a steam or sprinkler pipe. Walter Kidde & Co.

(56) **POWER TRANSMISSION** products, including chains, drive shafts, couplings and clutches, are described and illustrated in Catalog. B20-53. Morse Chain Co.

(57) **TACHOMETERS** having three separate ranges in each instrument. Reading errors are avoided by having only one scale visible at a time. Bulletin 103 also describes available accessories. Metron Instrument Co.

(58) **MASONRY DRILLS** and accessories. 4-page folder gives recommended utilization practices, prices of all available types. Tilden Tool Mfg. Co.

(59) **STREET LIGHTING LAMPS.** Complete technical data on all lamps recommended for this type of service including mean lumens, lumens per watt, and physical dimensions. Booklet S-413. Westinghouse Electric Corp., Lamp Div.

(60) **BATTERY CHARGERS** of the selenium rectifier type are specifically designed for electrically powered materials-handling equipment. Bulletin

4530 gives the type of use for which each charger is suited. Ther Electric & Machine Works.

(61) **MOTOR CONTROLS.** 2700 items such as starters, contactors, control panels, drum controllers and switches are described in new Catalog 101, complete with engineering data and wiring diagrams. Furnas Electric Co.

(62) **RECTIFIERS** for metal finishing and electro-chemical processes are called Selenifiers. Catalog 441 provides ratings, dimensions and illustrations of floor and bench type units; lists auxiliary equipment with descriptions of functions. American Rectifier Corp.

(63) **EARTH BORING MACHINES** are hydraulic-controlled, powered by a Ford gas engine mounted on rotating equipment platform; pole-setting accessories and winches available. Wyoming Valley Equipment Co.

(64) **LINE SAFETY EQUIPMENT** including belts, gloves, boots, climbers and a complete line of related hand tools. 32-page catalog. Miller Equipment Co.

(65) **INSTRUMENTATION** bulletins and catalogs currently available from the Industrial Division are listed in Bulletin 100-C Minneapolis-Honeywell Regulator Co.

(66) **RESIDENTIAL LIGHTING;** complete line including exterior units. 32 pages. Globe Lighting Products, Inc.

(67) **LUMINOUS-TUBE TRANSFORMERS** for indoor and outdoor applications. Bulletin GEA-5859C covers construction and operating features of the new Brick-Bat line plus ratings, dimensions and prices on all available types. General Electric Co.

(68) **MOTOR SLOT INSULATORS** of varnished cambric-paper. Bulletin 750G, discusses this and other combination insulators; gives data and specification numbers. Insulation Manufacturers Corp.

(69) **WELDING AND CUTTING** tools and equipment are detailed in this new catalog ADC 662B, prepared specifically for light industrial users such as job shops and maintenance departments. Function of each item is described together with suggested applications. Air Reduction Sales Co.

(70) **FLUORESCENT LAMPS.** A compact 24-page "Guide" for the non-technical user offers outline of fluorescent lighting characteristics with a complete listing of available lamps and pertinent data. Sylvania Electric Products Inc.

(71) **LOUVER DIFFUSER** for fluorescent fixture and illuminated ceiling installations.  $\frac{3}{4}$  in plastic grid, called Grate-lite, features low brightness and low maintenance costs. 8-page brochure describes performance and also several outstanding installations in detail. Edwin F. Guth Co.

## New Books

### Alternating-Current Machines (72)

An intensive survey of the operating characteristics of the most important ac power equipments, this third edition has been enlarged by approximately 20% to include new information on loading polyphase transformers, adjustable speed drives, and short-circuit reactions in alternators and rectifiers. By A. F. Puchstein, T. C. Lloyd and A. G. Conrad. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 721 pp. \$8.50.

### Rotating Electrical Machinery (73)

A revised version of a manual used by the Navy for training electrical technicians, this book is designed for classroom study in conjunction with practical demonstrations and experiments. Crow Electric-Craft Corp., 1102 Shelby St., Vincennes, Ind. 256 pp. \$3.50.

### 15 Home Lighting Ideas (74)

A new packet of home lighting data sheets titled "15 Home Lighting Ideas" has recently been published, which show modern lighting techniques for a wide variety of home areas, complete with construction and installation details. These data sheets each include a picture to show how the completed job looks, line drawings and sketches with dimensions, and complete illumination data. Prepared by the IES's Sub-Committee on Residence Lighting Data Sheets, and published by the Society. Copies are \$1.00 per packet, and may be obtained from the Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

### Plant Maintenance (75)

Latest techniques as discussed at the 1954 Plant Maintenance Show. Subjects include personnel, preventive maintenance and cost control. Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y. 300 pp. \$7.50.





## TO BUILD **Stab-lok**® SALES SELL BUILDERS (they're your biggest prospects)

FOR QUANTITY SALES of Stab-lok Circuit Breakers there's no one else equal to the builders in your area. They know that modern circuit protection goes over big with prospective home buyers, and that Stab-loks cost only pennies more than old-fashioned fuse boxes. Besides that, Stab-lok is the most *flexible* circuit breaker line ever marketed...it's Magic "E", sequenced bussing, standard NA and space saver NC breakers permit an amazing choice of circuits when first installed and when later changes are required.

And *only* Stab-lok provides these extra advantages:

**Complete dependability**—More Stab-loks are being installed today than all other circuit breakers combined...they're the only breakers service-proved in millions of homes.

**Lowest cost**—Across-the-board, Stab-lok costs less than other circuit breaker; less in the first place; less to install; less when circuits are changed or added.

**Most complete line**—With its unequalled range of enclosures, Stab-lok meets every sensible specification for circuit protection easily and quickly.

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Don't pass up your smaller Stab-lok prospects, but for top sales go after the *builders*. And write for the Magic "E" booklet that brings the whole Stab-lok story up to the minute. Federal Pacific Electric Company, 50 Paris St., Newark 1, New Jersey.



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Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.



# Reader's Quiz

## Fluorescent Tubes

**QUESTION H26**—Can rapid-start fluorescent tubes be used in an instant-start fluorescent fixture? Tubes to be used would be of same length and wattage—E.S.H.

**ANSWER TO H26**—No. The primary circuit of 40-watt instant-start ballasts is connected in series with one socket of each lamp. With instant-start lamps the base pins are short circuited inside the lamp. However, no such construction is employed in rapid-start lamps, so when used on instant-start ballasts, the primary current flows continuously through one cathode of each lamp. This would cause early end blackening and greatly reduced lamp life.

Rapid-start lamps are designed for use with rapid-start ballasts, and can also be used with good performance in starter-type fixtures. But they should never be installed in instant-start equipment.—C.L.A.

**ANSWER TO H26**—The instant-start ballast will operate rapid-start fluorescent tubes, but the lamp life will be cut about 50%. It is the instant-start bulbs that can only work on an instant-start ballast.—H.S.

## Motor Installation

**QUESTION J26**—A manufacturing plant has a room that was designed and laid out as explosion-proof. All the motors, conduit, and fittings are of the explosion-proof type. One fault with the room design is that a fire door was installed giving access to the rest of the plant and it is usually kept open.

Now the company wishes to install three motors which are not explosion-proof. They claim that no mixture will be made that gives off an explosive gas.

How can this be determined and what should be done about it?—G.J.

**ANSWER TO J26**—A test of the room atmosphere should be made with an explosion meter to determine the concentration and flash point of the explosive vapor. Reference should then be made to the National Fire Codes, Volume No. 1 on flammable liquids, gases, chemicals and explosives for guidance in evaluating the extent of the hazardous condition. The publication

also outlines methods of flash point tests. Article 500 in the National Electrical Code which specifies wiring methods in hazardous atmospheres should also be checked.—R.E.B.

**ANSWER TO J26**—This would depend entirely on the manufacturing operations conducted in the explosion-proof room. The National Electrical Code defines what constitutes a hazardous location and the degree of protection required. Local inspectors use this Code to determine if a specific installation is acceptable.

If the operations within the room are unquestionably not hazardous, there would be no need of explosion-proof fittings and apparatus, although there would be no objection other than cost to their use. However, if the operations are hazardous, or if there is any question that they might be considered hazardous, the inspector who will pass final judgment on the installation should be consulted to determine what he will require.—D.H.N.

## Arcing Ground

**QUESTION K26**—A 3-phase ungrounded system has an arcing ground on one phase. How does this arcing ground increase the voltage to ground on the other two phase wires? Does this sometimes change the frequency of the voltage to ground? Does the capacitance of the circuit affect the voltage rise?—M.D.

**ANSWER TO K26**—The first question can best be answered by reference to Fig. 1. Triangle ABC represents the voltages between the line wires. The neutral point, "O", equidistant from each corner of the triangle, repre-

sents ground, a tower, or even a neighboring tree. At this point, it will be noticed that the diagram actually is a wye within a delta. If the voltages and configuration of the circuit are reasonably "balanced", any side of the diagram is equal to 173% of the distance from neutral to either of the three corners. Now, if line B is grounded, point O moves to B. This increases the insulation strain at A and C by 73%, because the AOC portion of the wye becomes the vee ABC, grounded at the point B.

If more than the normal charging current flows through the ground connection at B, there is another ground, either on line A or line C. In such a case, AB or BC as the case may be, would be shortened. The amount of distortion of the triangle would depend upon the relative ground resistance. The swinging short circuit will load and unload the generator, resulting in speed changes of the prime mover. At the same time, there will be action of the voltage regulator. The combined result is a superposition of a "transient" frequency upon the system until the fault is corrected.

The effect of the capacitance of the ordinary transmission line to ground usually is regarded as negligible.—L.E.B.

**ANSWER TO K26**—The arcing ground whether it be in a phase winding or on a phase wire itself, increases the voltage to ground on the other two wires by placing the entire winding or a portion of it on the grounded phase in series with either of the other two phases depending where the meter to ground is placed.

On an ungrounded system with a ground such as this, the only return path is through the grounded side of the meter. The frequency is a generated quantity and as such should remain reliable, however the phase angle relations may change.

The capacitance of the circuit may and usually does affect the voltage as the capacitance between wires is always present and can thereby increase the voltage.

By drawing a 3-phase system and placing grounds in various positions and then placing a meter to ground, it can readily be seen how the windings are series connected and voltage to ground obtained.—J.B.K.

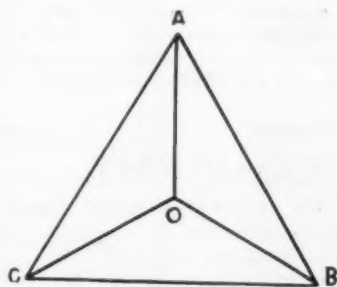
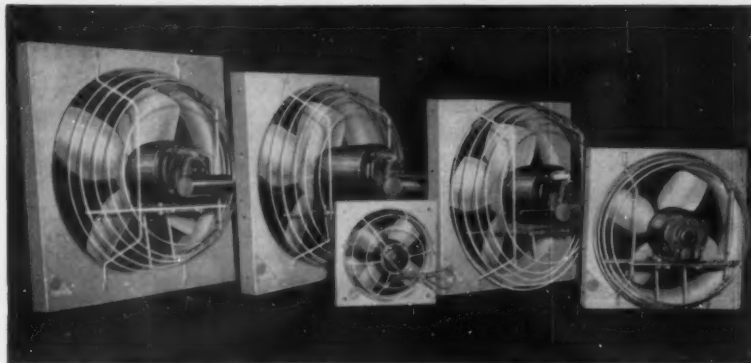


FIG. 1

# "BUFFALO" PROPELLER FANS Give Satisfaction On More Jobs



## N-V BREEZOS . . . Quiet, Efficient, Sturdy!

Contractors, dealers, wholesalers are enjoying bumper sales, and pleasing many more customers with these versatile, propeller fans! Low in first cost, quiet, and very durable, NV-Breezos are easily installed in walls for free air delivery—or can be used efficiently against system pressures up to  $\frac{1}{2}$ " 8", 12", 16", 18", 20" and 24" sizes. Write for Bulletin 3865.

## BREEZ-AIR . . . The Attic Fan In Top Demand!

Now's the time to get set for the thousands of home owners in your area who are top prospects for cool comfort on those hot nights to come! Better write today for our price and installation sheet FM-20 on the completely NEW Breez-Air. In 24, 30, 36, 42, 48 and 54" sizes to suit every installation, they are the finest and most efficient fans in the long Breez-Air history!



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BREEZ-AIR ATTIC FANS • "L" BREEZO FANS • "NV" BREEZO FANS

## Transformers

**QUESTION L26**—I would like to know how to figure the current in each of the conductors of a 3-phase load connected open delta. First, a range was rated 22 kw, 3-phase, 220 volts. It was connected to a 120/208-volt system, without connecting the neutral. One fuse kept blowing. Someone said the range was connected open delta and would need a larger fuse because the currents were not balanced.

Recently, a bank of two single phase 480-240-volt transformers were connected open delta and essentially the same thing happened, but by the past experience a larger fuse was put in the one line to which both transformers were connected. Transformers were connected 480 volts on the primary and were each of 15 kva capacity. They were connected to resistance loads so power factor was not involved.

Will some reader kindly explain how the various currents are connected? Also, should a power factor of less than 1.0 be encountered in the load, how would the primary currents and secondary currents be figured?—L.R.B.

**ANSWER TO L26**—An open delta or vee connected transformer bank will not have equal currents in both transformers, unless the 3-phase load is balanced. The two transformers will not carry equal watts load, unless the 3-phase load power factor is unity. Either transformer should not be loaded at more than 86.6% of its rating. Secondary voltages will tend to be unbalanced.

Fig. 1 shows either the secondary or primary currents when the load is balanced. Phase 3 does not have a transformer. If the load power factor is unity, each transformer will carry half of the load at a power factor of  $\sqrt{3}/2$  or 86.6%.

It will be noticed that the primary line currents are 30 degrees out of phase with the transformer phase currents. It is easy enough to visualize the splitting of the current from line A. But, how do B and C get around

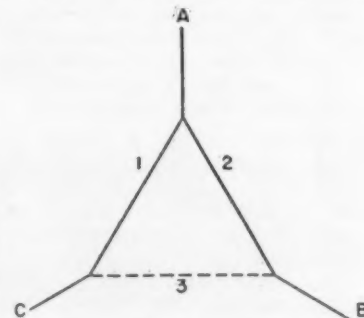


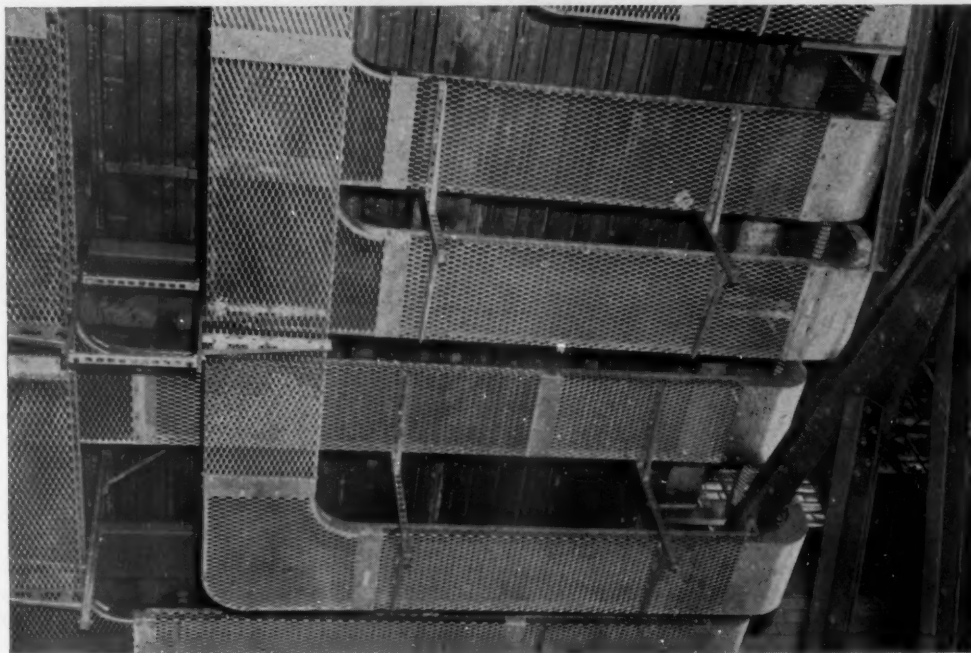
FIG. 1

# T. J. COPE, INC.

711 SOUTH 50TH STREET, PHILADELPHIA 43, PA.

Standard systems of trough and fittings for supporting power and control cable.

— For over 65 years, Manufacturers of Tools and Equipment for  
Installation of Underground and Overhead Electric Cables



Cope Cable Trough installed at Ohio Edison Company, Niles Station. Hatzel & Buehler, Electrical Contractors.

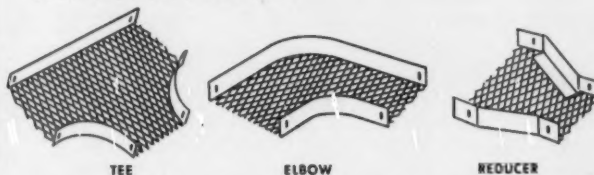
The Cope Standardized Systems of Cable Trough is a simple, sturdy, time and labor saving construction for the support of electrical power and control cables. Hundreds of engineers and contractors have realized the advantages to be gained through the use of this trough in leading industrial plants and utility generating stations.

Practically any layout problem can be met. Sturdy raceways of varying widths, at different levels and in any direction are easily installed. They can pass around, over or under obstructions and change from one size trough to another. For very unusual conditions, special fittings can be designed and fabricated.

Standard straight trough is in 8' lengths and in 3", 6", 9", 12", 18", and 24" widths. Trough is 1½" or 3" high including steel binding strip. Covers are also available. Assembly requires only the use of nuts and bolts which are supplied. All parts are hot dip galvanized. Write for Bulletin 9M for full details.

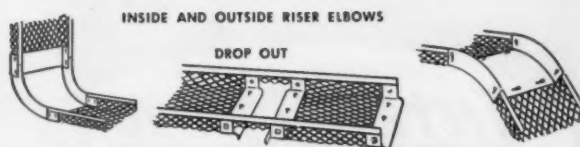
## COPE STANDARD FITTINGS

... in the Horizontal Plane



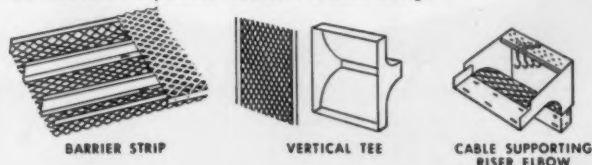
All fittings have radius corners to protect the cable from damage during installation and insure a neat finished job.

... in the Vertical Plane



Changes of direction or elevation are easily made with these and other standard fittings shown in Bulletin 65A. Write for it.

... Barrier Strips and Miscellaneous Fittings







## New E-Z SEE dial!

Now INTER-MATIC time switches  
are easier to read than your watch

Black on yellow is the most legible color combination known. That's why it's used on traffic signs and airport markings.

Inter-Matic has developed the new E-Z See dial, using new, larger numerals in instantly readable black on yellow colors. With the Inter-Matic "pull out, twist to set" feature, it is the fastest setting dial ever used in a time switch.

Contractors and sign men will save valuable installation time. The E-Z See dial is standard equipment on all models and combines with all the other outstanding features to make Inter-Matic the finest time switch available.

write

for Bulletin TS68 for full information and prices

**INTER-MATIC**  
TIME SWITCHES

INTERNATIONAL REGISTER COMPANY  
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the most  
DEPENDABLE  
time switch  
on the market



corners? Phase 3 is connected through the secondary load. Components must appear in phases 1 and 2 to handle this portion of the load, just as if the third transformer were present. A corresponding component must be present in the primary current.

Fig. 2 shows a complete vector diagram, with each phase having a different current and a different power factor. In this instance, current A was the largest. If different conditions had been assumed, either B or C could have been the largest of the three. The diagram checks, because A, B, and C form

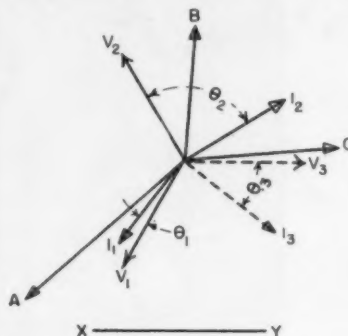


FIG. 2

a closed triangle when the head of one vector is placed to the tail of the next, and their angles (say with the reference line XY) are not changed. It would be a good exercise to draw Fig. 2 under various other assumed load conditions.

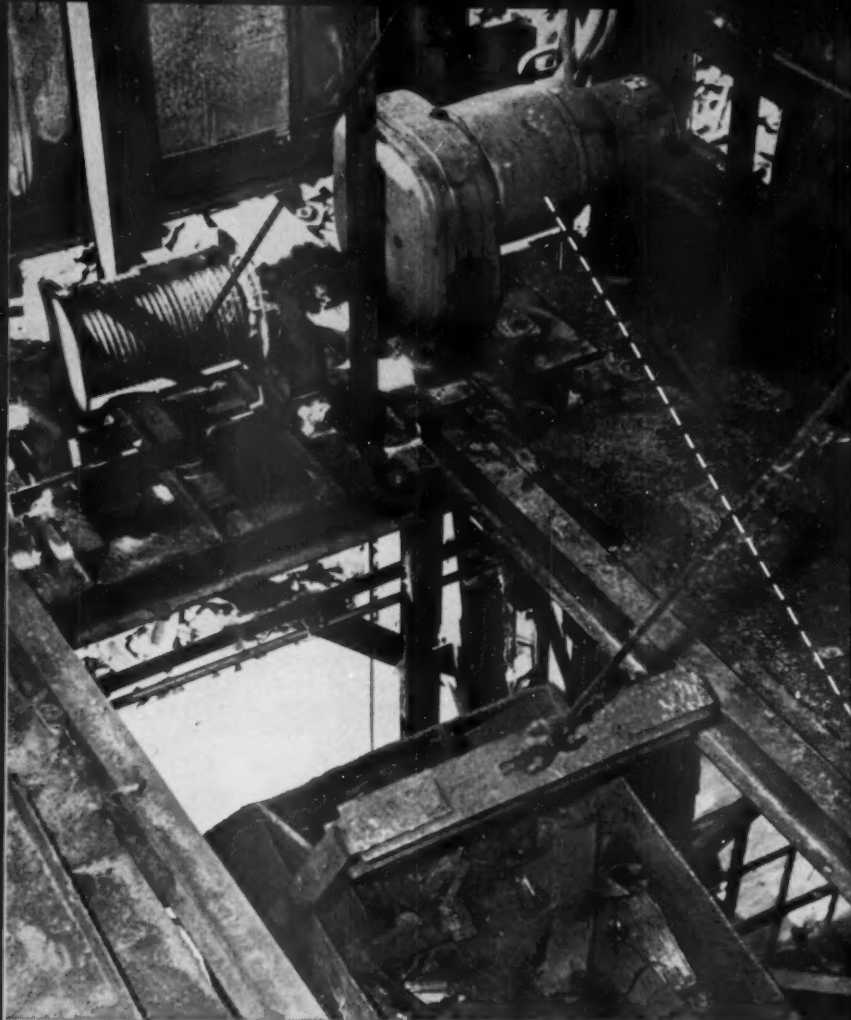
It is seldom convenient to measure the current and power factor in each phase of the load. Computation becomes quite difficult at other than unity power factor and balanced loads. The phase relationship of the line currents to each other can be found under actual load conditions by measuring the line currents with an ammeter, then plotting to scale to form a closed triangle. Neglecting transformer losses, the primary currents would form a similar triangle, with values equal to the secondary currents divided by the voltage transformation ratio.—L.E.B.

### Can you ANSWER these QUESTIONS?

**QUESTION W26**—I have a motor about the size of an ordinary  $\frac{1}{4}$  hp motor from which the nameplate has been removed. I do not know what voltage it should be used on or whether it is for ac or dc.

It has two brushes set on opposite sides of a commutator and there is no brush lifting mechanism. There are





## STANDARD BRAKE SHOE CHOOSES SLO-SPEEDS FOR RUGGED SERVICE

The power drive on our cupola charger has to take a lot of punishment, reports Mr. J. R. Karlovic, Plant Supt. for Standard Brake Shoe and Foundry Co., Memphis... and Slo-Speed with motor mounted brake gives us the dependable, trouble-free service we must have for day-in, day-out operation, carrying a load of 2500 lbs. and making 25 round trips per hour to keep our cupola charged with metal, coke and limestone.



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**In a nation-wide user survey of Sterling Slo-Speed Geared Electric Power Drives:**

**86%** Lowered Maintenance Costs. **56%** Increased Plant Safety. **76%** Reduced Lubrication Requirements. **56%** Obtained Better Protection Against Outdoor Exposure. **46%** Required Less Installation Space. **40%** Achieved Greater Cleanliness. **10%** Reduced Power Costs. **22%** Increased Production. **56%** Simplified Installations. **32%** Improved Employee Morale.

**12%** Achieved Quieter Operation. **38%** Modernized Equipment and Machines for Better Performance, Better Appearance.

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**There is a Sterling Electric Power Drive to Meet Virtually Every Requirement**  
Sterling Speed-Trol Electric Power Drives—for variable speed at its best  
Sterling Kloss and Kloss-Tite Motors—for constant normal speed at its best

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BUT . . . there's a hidden plus value that makes all this possible. It's the **ATTITUDE** of the people here at Erie Electric that actually build the transformers. These men grew up in the transformer business and their pride in their workmanship, we believe, is rare these days. They just won't let a shoddy piece of work slip by. That's a plus value that doesn't increase your price but it sure increases the reliability of your transformer. Make sure that Erie Electric quotes on *your* next transformer.



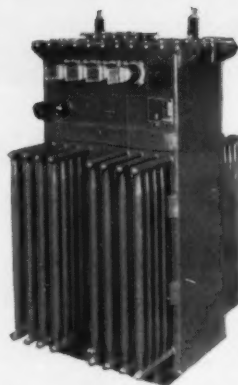
## Send for this **FREE BOOK!**

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NIAGARA 500 KVA, 60 cycle, single phase, 2400/4160Y - 240 x 480 volt oil-immersed self-cooled transformer conforming to EEI-NEMA 5th report.



**KISTLER BROTHERS, (L-R)** Casper W. and K. Thomas, are partners in guiding the fortunes of Kistler Electric Co., Colorado Springs, Colorado, electrical contractors handling light and power wiring and motor repairs.

two laminated poles, but the frame does not seem to be laminated.

Can some of your readers suggest any means of finding out whether this is an ac or dc motor and for what voltage?—E.E.M.

**QUESTION X26**—We are considering an application of bus way with plugs for machine connections. Its relatively high material cost leaves us in some doubt. Can some reader give us the installed cost, labor and materials, of such an installation as compared with conduit and wire?—D.H.N.

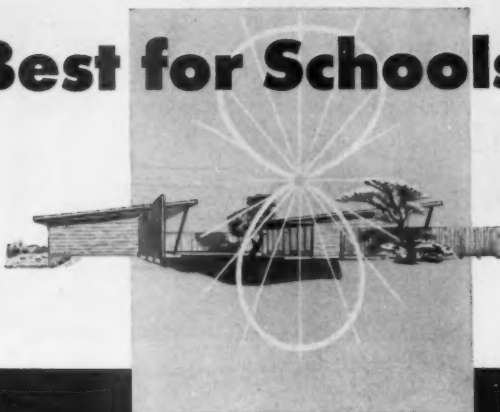
**QUESTION Y26**—I have seen many published accounts of various cooling means for neoprene power cables, including open air installations, water and sand in the trench fills. Do any readers have experience with altering the original soil conditions and increasing original soil thermal conductivity for better heat dissipation of these underground type cables?—L.W.F.

**QUESTION Z26**—A large vertical boring mill has two motors which are amplidyne drives and have a complicated control system. What is gained by such a system? What is the difference between the amplidyne drive system and others such as Thy-motrol? How is it different from the Ward Leonard drive?—J.H.B.

**QUESTION A27** What tests and inspections should be given rubber gloves used by linemen, and how often should they be checked?—D.H.N.

**PLEASE SEND IN  
YOUR ANSWER BY OCTOBER 15**

**Best for Schools** glare-free fluorescent...nearest to daylight



## MITCHELL **LODESTAR**

featuring  
**TRANSLUCENT SIDES**  
and  
**35°/25° SHIELDING\***

**4-FOOT & 8-FOOT MODELS**  
Available in 2 or 4 lamp luminaires,  
in a complete choice of lamp types

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Modern Styling**

4-Foot  
2-Lamp  
Luminaire

8-Foot  
4-Lamp  
Luminaire

**modern lighting planned for today's schools—  
superior illumination with low cost maintenance**

MITCHELL engineering perfects a new standard for school lighting. The "LODESTAR" Luminaire offers abundant light distribution with an absence of glare to approximate daylight conditions. This important lighting advance is attained by the substantial upward component with its "general diffuse" lighting effect, the semi-translucent side panels with pleasing low brightness contrast, and the superior louver design (35°/25°\* cutoff) which delivers properly shielded illumination to working areas. Smooth styling, very low maintenance factor and surprisingly low cost make the MITCHELL "LODESTAR" Luminaires the wisest choice for School Lighting.

\*Also available with 35°/45° shielding.

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quality  
counts  
**SPECIFY**

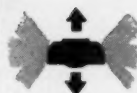
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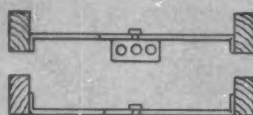
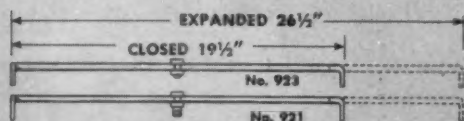
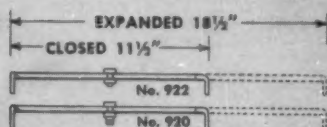


stud-bar

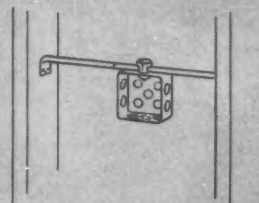
clip-bar

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# Questions on the Code

Answered by

**B. A. McDONALD,** New York Board of Fire Underwriters, Rochester, N. Y.

**GLENN ROWELL,** Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

**B. Z. SEGALL,** Consulting Electrical Engineer, New Orleans, La.

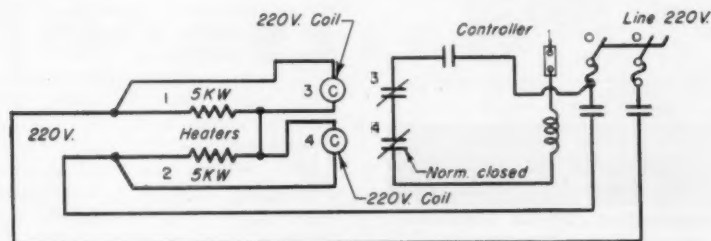
## Service Drop

**Q.** Can a service drop to a building be run alongside the wall of the building some 14 feet above grade level for a distance of about 50 feet before entering a building in order that we can bring this service directly from the outside into the transformer room? The voltage will be 4160 and the service drop consists of four No. 4 conductors. The thinwall will be 1½ inches inside diameter supported at 5-foot intervals to the masonry wall of the building.—M.L.L.

**A.** Section 7311 will prohibit the use of thinwall or electric metallic tubing and require the use of rigid conduit for service drops in excess of 600 volts. This section would also accept the use of a cable designed for this voltage or of individual conductors supported on glass, porcelain or other insulators which will keep the conductors at least 8 inches apart and at least 3 inches from the surface wired over. You will note under Section 7311 reference is made to Section 2387, in which we find permission to use the individual conductors.—G.R.

## Control Circuit

**Q.** In order to provide maximum safety on a gas dissociator the following circuit was used to shut down apparatus when heaters opened accidentally. Should any of the heaters open, 220 volts is imposed on the coil connected across the faulty heater and magnetically opens heating circuit. Please comment. On these normally closed relays 110 volts does not energize the coils.—P.P.G.



**A.** It appears from the diagram that coils Nos. 1 and 2 normally operate in series. If heater No. 1 is accidentally opened, current at 220 volts will flow through coil No. 3 and heater No. 2. The impedance of this circuit is such that 220 volts would not be imposed on coil No. 3.—B.A.McD.

## Insulation At Bushings

**Q.** Referring to Article 373, Paragraph 3736-b titled *Insulation at Bushings*:

*Is this paragraph intended to apply to 1-in. rigid conduit services containing two insulated and one bare No. 4 conductors for a single meter installation?*

*I would appreciate some clarification of the intent of the above mentioned paragraph.—D.L.*

**A.** Section 3736-b of the Code would, in my opinion, apply to the No. 4 service as described in your question. The rule applies to any ungrounded conductor which is No. 4 or larger in size. It definitely applies when such conductors enter or leave a conduit that terminates in a cabinet, pull box, junction box or auxiliary gutter. While the wording does not specifically refer to a meter box or enclosure, there would be no question in my mind that such boxes would be covered by the general designation of a junction box. This rule intends to safeguard the hazard presented when conductors, especially when sharply deflected, leave a metal bushing. The record of past experience shows that many failures occurred at such points even when the conductors were not

deflected. Evidently building vibration and humidity were contributing factors. In the case of service conductors, the importance of the rule is greatly magnified since they are not protected and when a fault occurs the resultant arcs and sparks may readily start a fire. I might further justify the rule by stating that conductors sharply deflected or even resting on a metal bushing are subject to pressure which in time causes the insulation to fail. While the present Code requirements only cover conductor sizes of No. 4 or larger many contractors, electricians and industrial engineers apply the principle involved to smaller size conductors. They have found from experience that the small additional investment involved is warranted by the additional safety obtained.—B.A.McD.

## Three Prong Plug Cap

**Q.** We are building a ½-inch drill and polishing unit having a magnesium exterior frame and in the past we have equipped this tool with a three conductor cord and a two blade cap with a pigtail sticking through the side of the cap. Now we are in receipt of a letter from one of our customers advising us it will be necessary that we provide a cap having three prongs with the grounding wire attached to the third prong. Is this required by the Code?—F.H.

**A.** Under Section 4010 of the National Electrical Code, you will find that a flexible cord containing a grounding conductor which is to be equipped with an attachment plug cap shall have a cap on and after January 1, 1955 which complies with Section 2559 a. and 2559 b. of the Code and under these two paragraphs, you will note the requirement for a three prong plug cap with the grounding conductor attached to the grounding terminal prong of the cap. As your customer no doubt expects to have these tools in stock on or after January 1, 1955, he is attempting to make sure his stock at that time will be in compliance with Code requirements.—G.R.

# GENUINE JOE SAYS:



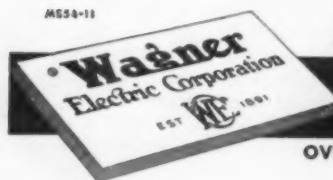
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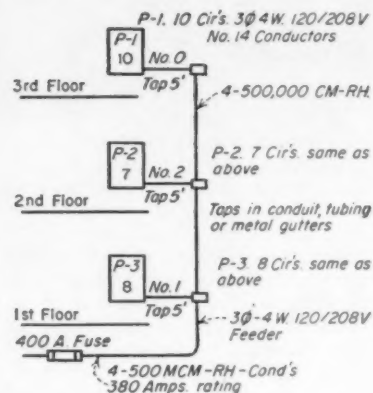
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## 5-Foot Taps To Panels

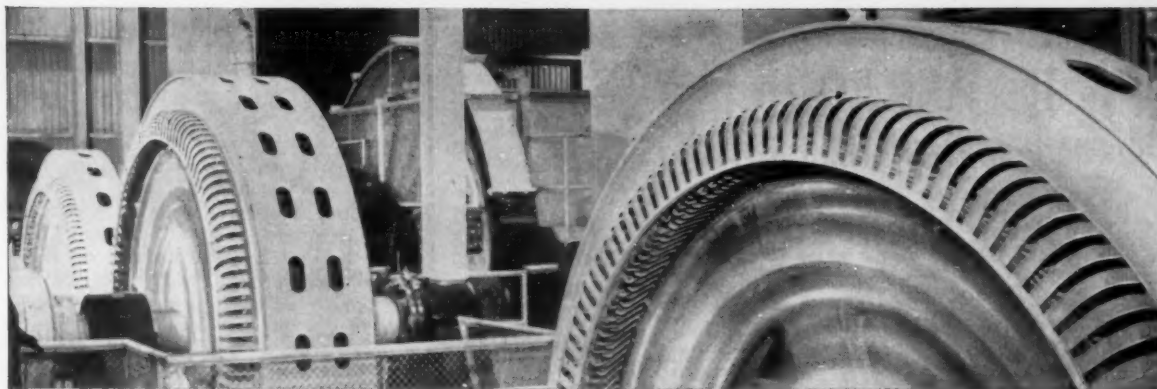
**Q.** Section 2434-c of the Code recognizes unfused 5-foot taps. The diagram below covers an application of this rule. How do you figure the size of taps to each panel? Is there any Code violation in this design?—E.T.H.



Tap to Panel No. 1 10x15A\*150A #0-RH  
Tap to Panel No. 2 7x15A\*105A #2-RH  
Tap to Panel No. 3 8x15A\*120A #1-RH

**A.** Section 2434-c recognizes the use of unfused taps as shown in your diagram provided they are limited to 5-foot lengths, are protected by conduit, tubing or metal gutters and their carrying capacities equal the sum of the allowable current-carrying capacities for the conductors of the one or more circuits or loads supplied. The size of the taps and the method of figuring same are shown on your diagram. As an example, Panel No. 1 has 10 3-phase, 4-wire circuits. The current-carrying capacity of each conductor of each circuit is 15 amperes. Since there are 10 circuits, it is evident that, if all the circuits were loaded to the 15-ampere capacity, the tap would carry,  $10 \times 15 \text{ A} = 150 \text{ Amperes}$ . This is the minimum size tap recognized by the rule and in most cases exceeds the total load served by the panel.

In the case you have presented, there appears to be a conflict with Section 3883 of the Code which also enters the picture. This section requires a lighting and appliance panel-board which is supplied by conductors having overcurrent protection greater than 200 amperes to be protected on the supply side by overcurrent devices having a rating not greater than that of the panel. Since the example you have presented apparently involves lighting and appliance branch circuits and the feeder is fused at 400 amperes, it would be necessary to install overcurrent devices on the supply side of the panel rated not greater than the



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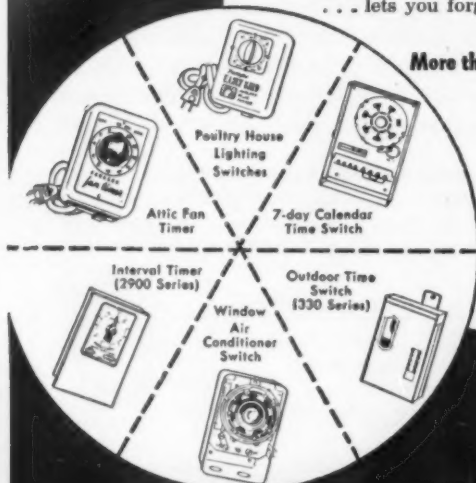


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TWO RIVERS, WISCONSIN

rating of the panel. The same provision also applies when the panel is equipped with snap switches rated at 30 amperes or less. The definition of a lighting and appliance branch circuit panelboard is covered by Section 3881 and undoubtedly covers the panels in question. However, if the panels served 3-phase power loads and neutral connections were provided for not more than 10% of its overcurrent devices rated 30 amperes or less, the provisions for panelboard protection, as above outlined would not apply.—B.A.McD.

## School Wiring

**Q.** We were successful bidders on a small consolidated school but after careful check of the blueprints and specifications, we find the size of service specified is not adequate to comply with Section 2203 of the Code. If we had realized this before submitting our bid, we would have submitted two bids, one based upon the existing specifications and the other on the Code together with an explanatory letter. However, through an oversight on our part, this was not done and we are now wondering whether or not we will be obligated to comply with the Code at the cost agreed to in our bid. Would you please venture an opinion on this?—A.M.M.

**A.** While this is actually a question which you should refer to your attorney, it is also one with which many contractors are confronted and I believe your first approach is to the architect or professional engineer who prepared the specifications and if he does not willingly agree to an extra, I would immediately seek legal assistance as the contractor is obligated to follow the minimum requirements as contained in the National Electrical Code even though there may be no regulatory measure in the political subdivision in which the school is located which requires compliance with National Electrical Code requirements.—G.R.

## Bus Bar Capacity

**Q.** Where does the Code cover the current carrying capacity of a bus bar? Just how would you compute the current capacity of copper bus bars  $\frac{1}{2}$  in. by  $1\frac{1}{2}$  in. and  $\frac{3}{8}$  in. by 2 in.?—G.R.

**A.** Section 3746 of the Code, covering auxiliary gutters, requires a bare conductor, so used, to be cap-



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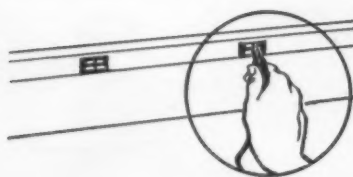
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able of carrying 1000 amperes per square inch of cross-section of the conductor. Section 3282 covering bare conductor feeders recognizes 1000 amperes per square inch in unventilated enclosures and 1200 amperes per square inch in ventilated enclosures. Article 364 covering busways does not specifically cover this point since this material is usually approved by Underwriters' Laboratories and questions concerning carrying capacity are covered by the rating assigned by U. L. in accordance with Section 3653. Since bare conductor feeders may be used only by special permission, it appears that we should not apply these requirements for general use. If however you are building an auxiliary gutter, you could use copper bus bars with a current carrying capacity as high as 1000 amperes per square inch. It is important to note that this is a maximum figure and it may be necessary to de-rate this value in line with the details of design and existing conditions of use.

On the basis of 1000 amperes per sq. in. the current carrying capacity of the bus bars covered by your question would be computed as follows:

$\frac{1}{4}$  in.  $\times$   $1\frac{1}{2}$  in. = .3125 sq. in. = 312.5 amperes

$\frac{3}{8}$  in.  $\times$  2 in. = .750 sq. in. = 750 amperes—B.A.McD.

## Fixture Wire

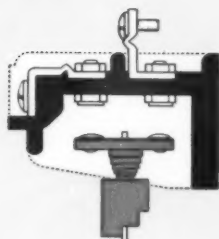
**Q.** I recently inspected a building in which the electrical contractor had installed continuous row lighting consisting of surface mounted fluorescent fixtures. From his distribution cabinet to the first fixture in each row he had extended a No. 12 wire circuit but from there on he had obtained fixtures having unusually long fixture wire leads and had used these leads as the circuit wires from one fixture to another. Was I not correct in refusing to accept this installation until such time as he had extended the No. 12 circuit through to the last fixture on each circuit?—W.R.B.

**A.** You were correct in refusing to accept this installation as fixture wire cannot be used for circuits. Section 2127 of the Code specifically outlines the installation of circuits and provides for the use of fixture wires as taps only from the circuit wires. Then under Sections 4149 and 4150 of the Code you will also find that the circuit wires extend by the fixtures with the fixture wire tapped to the circuit wires for each fixture.—G.R.

# Bulletin 709 Starters are SO TROUBLE FREE

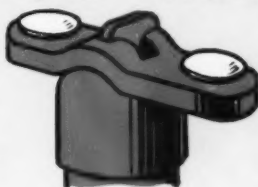
... .. *because they are* SO SIMPLE

## DOUBLE BREAK, SILVER ALLOY CONTACTS—NO MAINTENANCE

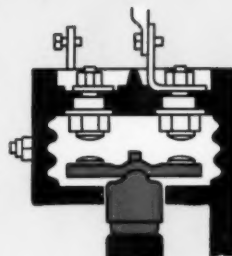


SIZES 0 & 1

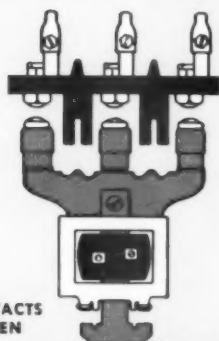
Some 20 years ago, when Allen-Bradley announced the new Bulletin 709 solenoid starter, a big feature was the change from single break, copper-to-copper contacts to double break, silver alloy contacts. A warning on the name plate said: DO NOT FILE, CLEAN, OR DRESS CONTACTS.



At first, maintenance electricians paid little attention to this request. Who had ever heard of running motor starters without contact maintenance? But, today, the dependability of Allen-Bradley starters is taken for granted. They have proved they are good for millions of trouble-free switching operations.



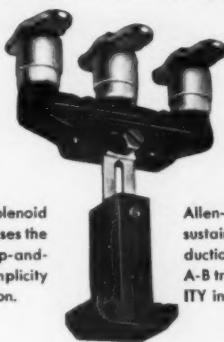
SIZES 2 TO 7



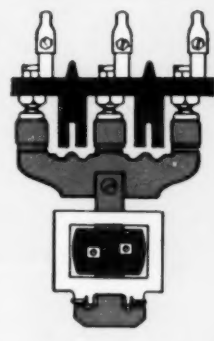
CONTACTS OPEN

## ONLY ONE MOVING PART—NOTHING TO RUST AND STICK

The Allen-Bradley solenoid starter design was new and revolutionary in 1934. By doing away with clapper contacts, it eliminated hinged linkages, pivots, pins, and bearings. Only one moving part... the one-piece solenoid plunger... opens and closes the contacts with a simple up-and-down motion. Such simplicity assures unfailing operation.



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CONTACTS CLOSED



Under the same operating conditions a machine with many moving parts is more likely to develop trouble than a simpler machine with fewer moving parts.

The same rule holds true for motor starters. Most starters have complicated linkages, bearings, hinges, pins, and pivots in their mechanisms. Each moving part is a potential troublemaker.

Allen-Bradley Bulletin 709 magnetic starters are SIMPLE—they have ONLY ONE MOVING PART. If you want maintenance free motor controls... specify Allen-Bradley. Let us send you the latest A-B information—the A-B Handy Catalog.

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# ALLEN-BRADLEY

## TROUBLE-FREE MOTOR CONTROLS

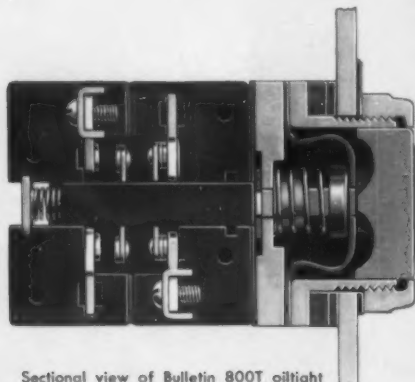
QUALITY



# OILTIGHT PUSH BUTTONS



Start Button with Double Pole NC and NO Contacts



Sectional view of Bulletin 800T oiltight push button showing operator shaft carrying moving contacts. Stationary contacts are mounted in the molded contact block. The oiltight flexible diaphragm is between push button and contact block.

Assemble any combination of operators and contact blocks



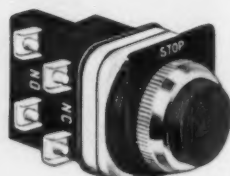
OPERATORS



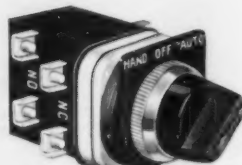
CONTACT BLOCKS

Bulletin 800T operators and contact blocks are available in many forms. They may be assembled interchangeably in various combinations, thus reducing your motor control parts inventory.

Here are a few of the many Allen-Bradley oiltight pilot units for machine tool service. They are available for mounting on machine frames in a variety of single units or in any combination of one or more units in oiltight enclosures. A flexible diaphragm, not affected by oil or cutting fluids, is inserted between button and contact block (see diagram at left) to prevent oil seepage into the contacts.



Type BA Stop Button



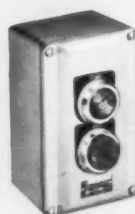
Type H2B Selector Switch



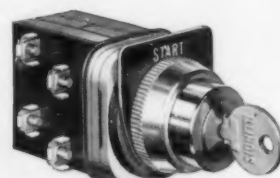
Type K2B Jog Button



Type 6PX  
Pendant Control



Bulletin 800T  
Type 2TA in  
Two-button Oiltight  
Enclosure



Type E11B Cylinder Lock Button



Type P26 Pilot Light



**ALLEN-BRADLEY**  
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**MOTOR CONTROL**

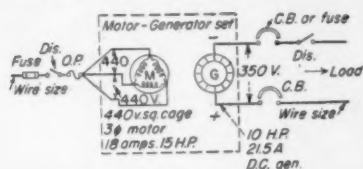


## Motor Generator Circuit Wiring

**Q.** Motor-Generator Set. Input—440 volts ac 3-phase, 15 hp 18 amps squirrel cage. Output—350 volts, dc—10 hp—21.5 amps. Determine size of switch, fuse rating, heater rating and size of each conductor. What equipment is necessary for the dc output? Size of wire to load of generator?—G.R.

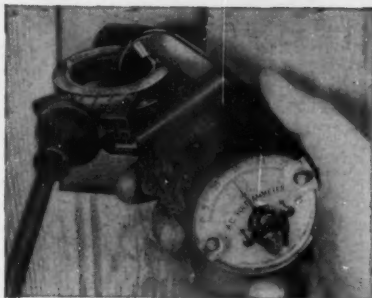
**A.** I have shown by the illustration the details of the problem as I understand them. The 15 hp, ac motor would be subject to the provisions of Article 430, N. E. Code. In the absence of any specific information regards the characteristics of the motor, such as code letter identification etc., I have assumed that the motor is full voltage starting. In figuring the size of the branch circuit fuse, the 20-ampere motor rating shown in Table 24 is used. In figuring the motor-running overcurrent device the 18-ampere nameplate current rating is used. The computations are shown on the illustration.

The generator wiring is covered by Article 445 of the Code. In the absence



Motor—15 HP. A.C.  
Br. circuit fuse, 300% $\times$ 20A=60A.  
Disconnect sw.—15 H.P. rating.  
O.L. prot. 125% $\times$ 18=22.5 amps.  
Conductors 125% $\times$ 20=25 amps (No. 10)  
Generator, D.C.  
Cond's 115% $\times$ 21.5=24.7 amps (No. 10)  
O.L. prot.—see 4454 N.E.C.  
Disconnect—C.B. or sw.

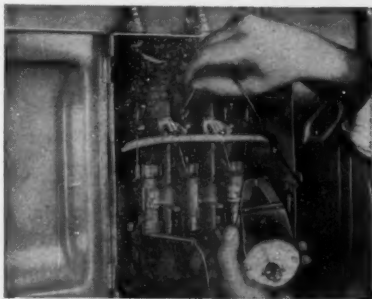
of any detail concerning the characteristics such as 2- or 3-wire and field coil arrangement, I have assumed a 2-wire generator. Section 4454 covers the overcurrent protection required and while the provisions are not specific the Code requires in general that generators shall be protected from excessive current by circuit breakers or fuses. I believe this general requirement is influenced by the thought that some generators are so designed that when overloaded, the voltage decreases sufficiently to limit the current and power outputs to values that will not injure the generator during a short period of time. In the absence of any definite advice from the manufacturer in this respect, I believe the generator should be protected by overcurrent devices, in each conductor, rated to correspond to the full-load current rating of the generator. Section 4454-a recognizes in some cases, a



Check appliance current at receptacle



Trouble-shoot relays quickly



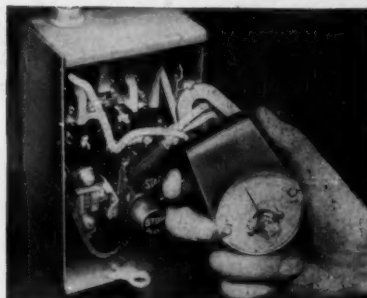
Instantly determine if fuses are good



Know if the load is balanced



Know if windings are grounded



Expand low-amp reading by doubling lead

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cations, multi-range Amprobes available for 300, 600 or 1200 amperes. See the full line of Amprobe snap-around volt-am-meters at your jobber's today. PYRAMID INSTRUMENT CORP., LYNBROOK, N.Y. (Export Div.: 458 Broadway, N. Y. 14)

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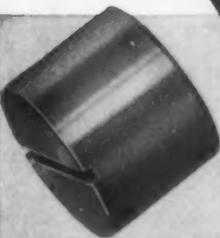
- Pyramid Instrument Corp.**  
Dept. ECM94, Lynbrook, N. Y.
- Please send me the Amprobe service bulletins checked below:
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  - ☐ Trouble-shooting electric motors
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protective device in one conductor of the two wire supply. We must remember however that this requirement applies to the generator protection only and that the question concerning the protection of the conductors also must be satisfied. If one of the conductors is grounded there is no conflict. If not, there is a question with respect to proper conductor protection when one overcurrent device is used.

Article 445 does not cover the question of a disconnect. It appears however that the requirements of Section 2351 covering services should apply. We are obtaining through the generator a source of power and it should be controlled by a switch the same as any other source of supply from an electric utility. I personally believe this switch or circuit breaker must meet all of the requirements for a service disconnect as covered by Article 230.—B.A.McD.

## Grounding

**Q.** In our town the city water-works department is now using the plastic pipe for service entrances to the buildings, so we can no longer make our grounding connection at the meter location. How do you suggest we ground the neutral terminal in the service switch under this condition?—H.S.

**A.** Under Section 2582 the Code provides that where a water system is not available for the grounding of this neutral, it may be grounded to a continuous metallic underground gas piping system or to other metallic underground system which may be available; and where such piping is not available, under 2583 it provides for the use of a made electrode which may consist of a driven rod, pipe or a buried plate. You will also note under Section 2584 that the resistance on a driven pipe, rod or buried plate must not exceed 25 ohms and in those cases where a single rod or other electrode does exceed 25 ohms, two or more shall be used tied in parallel to reduce the resistance to earth below 25 ohms.—G.R.

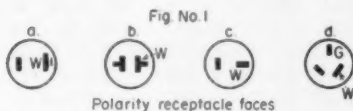
## Polarized Type Receptacles

**Q.** Section 5105-c-4 of the Code requires, in a commercial garage, that receptacles and attachment plugs be of a polarized type. Section 2124 of the Code requires in the laundry of a dwelling occupancy a 3-pole type of receptacle designed for

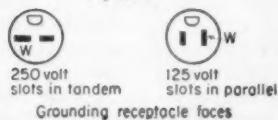
grounding. Section 2559-a-b also covers the grounding receptacles and plugs. Is there any distinction between a polarity type of receptacle and one designed for grounding purposes? Could I use a grounding receptacle for the laundry in a commercial garage as meeting the requirements for a polarized receptacle?—T.A.

**A.** While the Code does not define the terms polarized receptacle or cap, I am advised by Underwriters' Laboratories that their standard requires all general-use 2-pole receptacles, which have a 125-volt rating to be polarized, and also requires all 3- and 4-pole general-use receptacles to be polarized. They further advise that a receptacle is considered to be polarized when it will receive a matching cap in one direction only. It therefore follows that all 2-pole parallel blade and 3- and 4-pole receptacles and caps are polarized under such a definition.

In order to clarify the question, I have shown by Fig. No. 1 four types



Polarity receptacle faces



Grounding receptacle faces

of receptacles, recognized by U. L. as polarized receptacles. (a) covers parallel slots with one slot wider than the other. (b) covers T slots with one of the parallel slots wider than the other. (c) covers a combination of one vertical and one horizontal slot and (d) covers a 3-pole receptacle which has one of the current carrying slots wider than the other and also a third slot marked G provided for the purpose of grounding equipment. The slots marked W are plated white and serve the grounded circuit conductor. It is evident that when a matching cap with wide and narrow blades is used that it would be impossible through such a connection to obtain a reversed polarity. It follows, however, that in the case of (a) and (b) the conventional 2-wire parallel blade caps could be used and inserted in either position with no regard to polarity. In other words these receptacles have dual purpose features, one of which provides polarity and the other does not. In the case of (c), we do have a true polarized receptacle since its design restricts its use to one matching polarized cap and the conventional parallel blade caps

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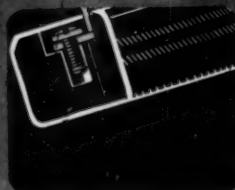
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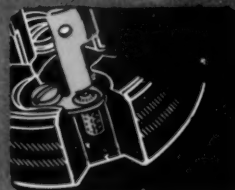
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COME OUT



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OVER AREA



## "Speed-Easy" Wiring Convenience

HEAVIER SCREWS  
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WIRING ROOM



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RUGGED STEEL  
ARMOUR PLATE SHELL  
FOR MAXIMUM  
PROTECTION  
AGAINST BREAKAGE



## Adjustable Cord Grip

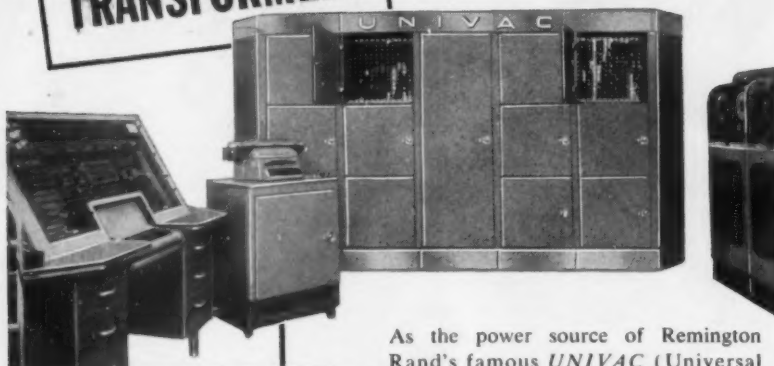
ADJUSTABLE, STOUT  
HOLD-TITE CORD  
GRIPS TAKE STRAIN  
FROM BINDING  
SCREWS





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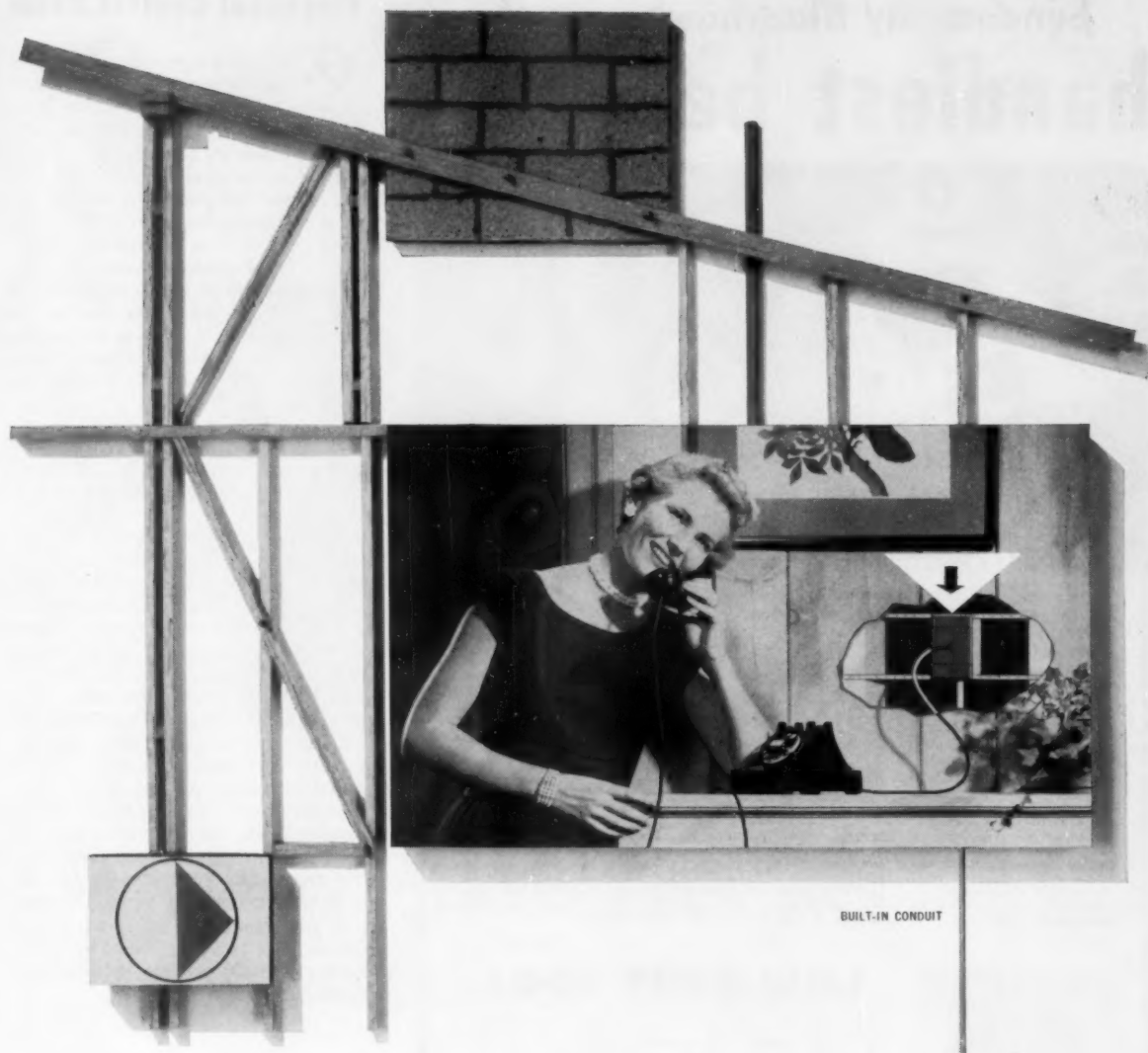
PIONEERS IN THE FIELD OF DRY TYPE TRANSFORMERS

could not be used with such a receptacle.

Fig. No. 2 shows one of the new 3-wire designs of grounding type receptacles with the blades arranged in tandem for 250-volt devices and in parallel for 125-volt devices. This arrangement intends to satisfy the new provisions of Section 2123 of the Code, which safeguards the hazard of connecting 125-volt into 250-volt circuits or 250-volt appliances into 125-volt circuits. These grounding receptacles are definitely recognized as such by the new provisions of Sections 4164 and 4165 of the 1953 Code. In addition to the grounding features involved with the design of these receptacles, they also promote a polarity connection and when used with 3-pole caps they provide a positive polarity connection. It also follows when the proper 2-wire caps are used, that polarity also is obtained. It is possible, however, to use the conventional 2-pole parallel blade caps with these receptacles which give no assurance of a polarity connection.

As a result of the foregoing, a question now arises concerning the provisions of Section 5105 of the Code which requires a polarity type of receptacle in the garage occupancy. Will any of these dual-purpose receptacles satisfy this requirement? At first thought, it appears that when the Code requires a polarity receptacle that one should be provided, as shown by Fig. No. 1-c, that has no dual-feature and may be used only with one cap that assures a polarized connection at all times. There is a question involved with such procedure since the principal feature involved with polarization concerns the connection of the grounded circuit conductor to the screw-shell of a lampholder. In a garage occupancy many portable tools are used for which there is no requirement or occasion to consider a polarized connection. There is, however, considerable concern regarding the grounding of the metal frames of such equipment. Under such conditions should we insist that a polarity receptacle, so designed that it would be impossible to connect any portable appliance to it by any attachment plug which could be inserted in any other than one position, be used? In the absence of any definite Code provision on this point, I believe that the standard of U. L. which recognizes the dual-feature is a practicable answer to the problem presented. It therefore follows in answer to your principal question that a grounding type of receptacle, as described in Section 4164 of the Code would satisfy the polarity requirements for receptacles in a garage occupancy.—B.A.McD.





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## Ventilating an Electrical Control Room

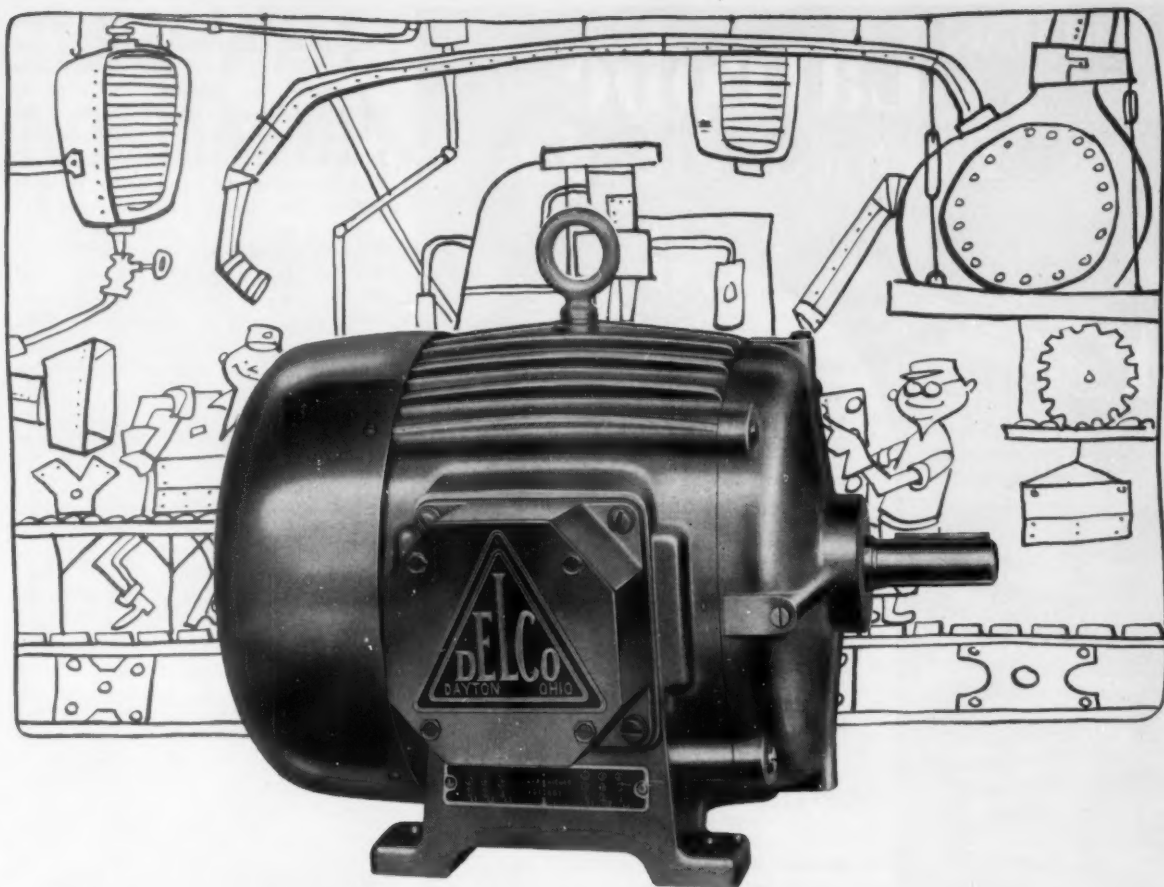
**Q.** We have a problem of properly ventilating an electrical control room to be located on the garner floor of a large terminal elevator in this city. We were able on other floors to locate control rooms against an outside wall but we find this impossible on this one floor where we must locate this room about 20 feet from the nearest outside wall. These control rooms are constructed of lightweight concrete blocks and there is some question as to whether or not the ducts to the outside wall have to be equivalent to the walls of the control room. What will the Code require?—M.M.

**A.** Under Section 5059, you will find permission to use metal ducts constructed of metal not lighter than 24 gage provided it is properly protected against mechanical damage and against rusting or other corrosive influences. All seams or joints shall be riveted or bolted and soldered or welded as they must be rendered dust-tight and the outer ends of the ducts must be screened to prevent the entrance of birds or small animals. This same section also gives permission to use any other noncombustible material for the construction of ducts which would be equally substantial to a duct constructed of 24 gage or heavier sheet metal. While the Code does not require pressure ventilation of these control rooms, the Code is very specific in stating that the rooms must be dust free and experience has proved that this can best be accomplished by maintaining a slight pressure within each control room.—G.R.

## Terminal Connections — More Than One Wire

**Q.** Paragraph 1117 says, "Terminals for more than one conductor shall be of a type approved for the purpose." Does this mean that any terminal with, say two turned-up lips, as often found in plastic surface wiring devices, would accommodate two wires — one on each side of the binding screw? How does one know if the terminal can be used for more than one wire?—E.S.S.

**A.** Section 1117, requires in general, that the connection of conductors to terminal parts shall be made by means of pressure connectors or solder lugs with an exception that No. 8 or smaller solid conductors and No. 10 or smaller stranded conductors



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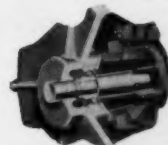
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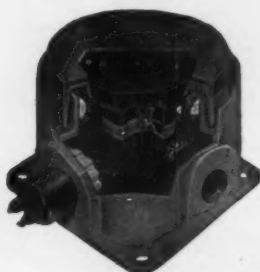
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may be connected by means of clamps or screws with terminal plates having upturned lugs. As a result of this Code provision the binding-screw type of terminal for such size conductors must have turned-up lips to hold the wire in position so it will not be forced out of place when the screw or nut is tightened. The design does not infer that such a terminal is approved for the connection of more than one wire.

According to the 1952 Underwriters' Laboratories Electrical Equipment List, page 502 a pressure terminal connector is approved to accommodate one solid or stranded wire unless otherwise specified. A review of the manufacturers listed will show the various designs which are approved for more than one conductor of the same size or various sizes. While these listings do not specifically refer to the terminals of receptacles or switches of the conventional types or those designed to be used without outlet boxes, it is my opinion that the terminals of such devices are approved for the connection of only one conductor, and if any question on this point arises, it may be settled only by reference to the U. L. List. If the point is not covered by U. L. I believe we are correct in assuming that the terminal shall accommodate only one conductor.—B.A.McD.

### Flexible Metal Conduit

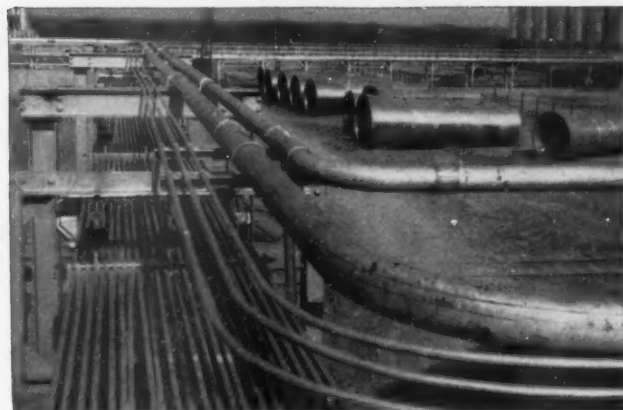
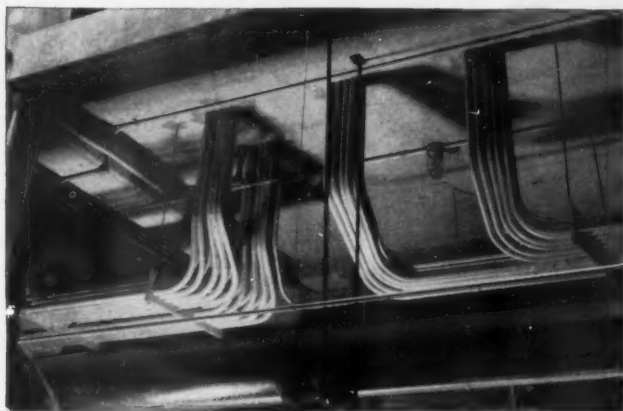
**Q.** Is liquid-tight flexible metal conduit approved by the Underwriters' Laboratories for use in a Class 2 location?—E.A.A.

**A.** No, this liquid-tight flexible metal conduit has not been approved by the Underwriters' Laboratories for use in a Class 2 location. However, under Section 3512 of the Code, you will find permission to use this new conduit in a Class 2 location only as provided for in Sections 5014 b., 5054 and 5073 of Article 500. Section 5014 b. has to do with Class 1 Division 2 locations, and under Section 5054 a., 2. you will note permission to use flexible metal conduit where it is necessary to employ flexible connections provided it is used with approved fittings in Class 2 locations which do not contain dusts of an electrically conducting nature. This would limit its use to a Class 2 Group G location and only where it was necessary to have flexible connections between rigid conduit and motors or other equipment where flexibility was essential. Paragraph a. 2. under Section 5073 provides for the use of this raceway in a Class 3 location.

You will note that Section 5054 does



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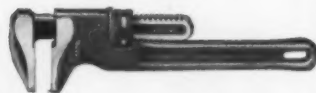
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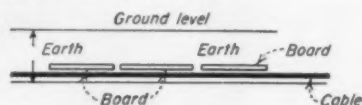
THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U. S. A.



not specify that the flexible conduit used must be of the liquid-tight type and therefore this section would accept either the liquid-tight type or the conventional flexible metal conduit for such connections.—G.R.

### Protection — Underground Cables

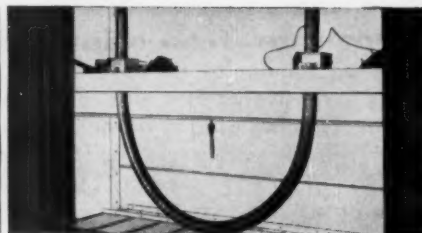
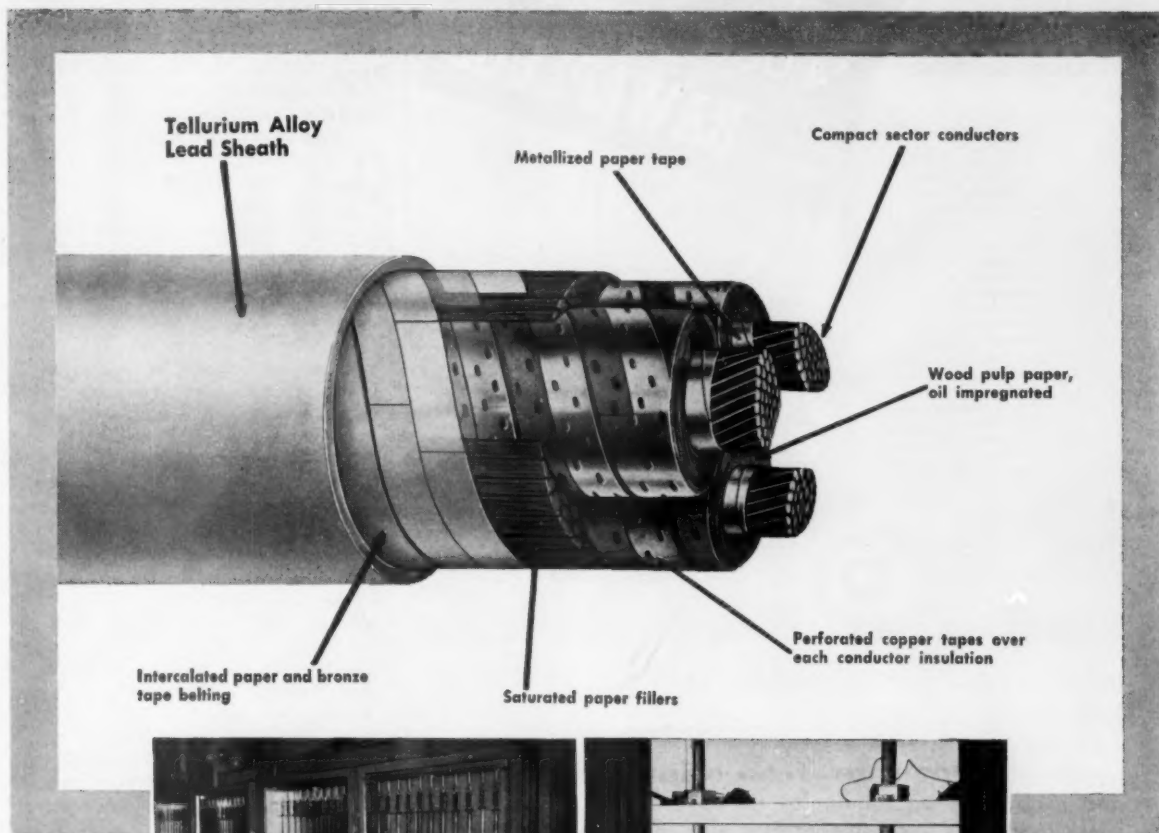
**Q.** Section 2311 states that underground conductors be protected by duct, conduit or as approved cable for such installation. We have always used rigid conduit for underground runs but recently a friend told me that the word conduit can also mean thin wall tubing EMT. Is he correct? Some of the local authorities will not permit RR or UF cable to be installed without additional protection underground. For instance, one local authority will approve the use of RR or UF directly buried 2 feet in the ground with some form of mechanical protection such as boards placed above cable. What is your comment?—P.P.G.



**A.** On questions concerning the protection of approved underground cables from mechanical injury, it is difficult or possibly impracticable for the Code to set up definite provisions in this respect. The various conditions of use to which such cables may be applied present problems which may only be answered at the time of installations in line with the conditions which are involved. As an example, the crushing effects on a cable passing under a railroad line would be more severe than that presented when the cable is run under the driveway of your home; or a cable run under your lawn from house to garage may be considered free from mechanical abuse but if it was run under a flower bed which involved digging with sharp tools, it possibly would be subject to mechanical injury.

Underground cable installed on farm properties presents another condition of use that merits consideration. Such cables run between barns and other outbuildings could be subjected to the crushing effect of heavy farm machinery and the hoofs of horses and cattle. During a rainy spell, small pools of water are formed and if such areas are accessible to cattle, it is possible for such animals to not only injure the cable but to destroy themselves from electric shock. The question of depth in the ground also enters the

# FOR INCREASED LOAD REQUIREMENTS...PAPER INSULATED CABLE WITH TELLURIUM ALLOY LEAD SHEATH



Some of the specially-developed testing equipment with which Roebbling maintains quality control of the production of Tellurium Alloy Lead Sheath. #1 Temperature control ovens for creep test of strips cut from tellurium alloy lead cable sheathing.. #2 Temperature control oven for bending fatigue test of full cable section.

YOU'LL REALLY solve power cable headaches with Roebbling Paper Insulated Cable with the new Tellurium Alloy Lead Sheath\*, a Roebbling exclusive. Here are some of its outstanding advantages:

- 1-Tellurium Alloy Lead Sheathed Cable has a lower long-time creep rate;
- 2-Extra high fatigue resistance;
- 3-High bursting strength;
- 4-Exceptional stability under heat application as in duct splicing and wiping;
- 5-Abolishes need for frequent stop joints or reinforced lead sheath;
- 6-Doesn't require generous expansion bends or large manholes;
- 7-Heat application in splicing leaves its desirable properties unimpaired.

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**\$4,000<sup>00</sup> Saved**  
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#### INSTALLATION SUPERINTENDENT SAYS:

Gentlemen:

As superintendent of a leading hospital equipment company responsible for the erection and installation of metal cabinets and laboratory equipment at the N.Y.C. V.A. Hospital, I used Rawlplugs extensively. This was in preference to any other type fasteners being used in a similar type of construction. My experience with many types of fasteners has proven to me that the Rawlplug has saved my company many labor hours over that of others.

(signed) Joseph Turkowski, Supt.

You, too, can save money with Rawlplugs. Why not investigate.

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**RAWLPLUGS**—Universal screw anchor for any material. The original fibre plug for wood and lag screws.

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**RAWL-TAPERS**—A machine screw anchor that fits the hole drilled either by a new or worn drill.

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**RAWL CARBIDE DRILLS**—Spiral precision tool for rotary drill or hand brace. Sizes 5/32" to 1-1/2".

**RAWL HAMMER-SETS**—Heavy duty threaded type machine bolt anchor.

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**RAWLDRILLS**—For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

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**DIMENSIONAL CHART** of above products.

**THE RAWLPLUG COMPANY, Inc.**

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picture. In order to avoid the mechanical abuse involved when cables are buried above the lowest point of frost line, it is desirable and required by many that the cable be installed below the frost line. Here conditions vary with geographic locations. While our Northern states have this problem to consider, our Southern states do not.

I believe the foregoing personal observations show that the variables involved with the installation and the protection of underground cables makes it impractical for the Code to make specific rules for such installations. As you state, Section 2311, which covers the mechanical protection for underground services, requires the use of ducts, conduits, cables approved for the purpose or other approved means. The second paragraph of Section 3102-b, which is new in the 1953 Code, advises that there are two types of cable assemblies which are recognized for direct burial in the earth, types USE and UF. The wording of this Code provision indicates that such cables may be buried, in some cases without supplementary mechanical protection but when the authority enforcing the Code believes that existing conditions warrant same, additional protection may be afforded by the use of covering boards, concrete pad, raceways etc. A similar provision also appears under the new Article 338 covering type UF, underground feeder and branch circuit cable.

Section 3482 (2) of the Code indicates that electrical metallic tubing may be used for the protection of conductors which are installed underground. No. 1 of the same section advises that EMT shall not be used where during installation or afterwards, it will be subject to severe mechanical injury. Here again, the Inspector must answer the question in line with the conditions presented. While the term RR used in your inquiry is not recognized by the Code unless qualified by Underwriters' Laboratories approval as a type USE or UF cable, you should check this.

As a result of the foregoing comments, it appears to me that approved underground cables may, in some cases, be buried without additional protection. They should be installed below the frost line. When they cross under driveways or otherwise are so located as to be subject to the crushing effects of heavy vehicles, they need additional protection such as conduit set in concrete or planks impregnated with creosote. When installed on farm properties which involves cattle, they should be so located or protected that they do not present a hazard to such animals. As far as the Code is concerned, the authority enforcing same has the responsibility of determining the solution to the problem presented.—B.A.McD.





## Clear Case for Lighting by Litecontrol

Neither shadows nor glare mar this modernized Superior Court room in New Britain, Connecticut. LITECONTROL 5628 surface-mounted fixtures blend attractively with the appearance of the room, fill it with plenty of comfortable, low-brightness light.

Holophane lenses direct the high-intensity light for maximum comfort. Diffusing glass side panels throw some light on the ceiling to minimize contrasts. Lenses are easily removed from below for cleaning the fixtures or replacing tubes.

This rugged semi-direct fixture is simple to install, either individually or bolted together in rows. Like all LITECONTROL fixtures, it may be modified, or combined with others, to make truly custom lighting for many different interiors.

For every job, LITECONTROL means custom lighting at standard fixture prices. . . . Call your local LITECONTROL representative.

INSTALLATION: Superior Court, New Britain, Conn.  
 ARCHITECT & ENGINEER: Mandel Baldessari  
 CONSTRUCTION: Bessoni Bros., New Britain, Conn.  
 ELECTRICAL: Grem Electric Co., New Britain, Conn.  
 FIXTURES: Litecontrol No. 5628  
 LAMPS: Standard Cool White  
 SPACING: 8' on centers  
 CEILING HEIGHT: 12'  
 FLOOR: rug is Beige, linoleum is Jasper  
 WALL: birch plywood, stained mahogany  
 CEILING: acoustical tile  
 INTENSITY: 75 Footcandles average in service

  
**LITECONTROL**  
*Fixtures*  
 KEEP UPKEEP DOWN

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 36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

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# NOW-A Better Tap Connector THAT'S EASIER TO USE YET COSTS LESS



The all-new IDEAL Tap Connector is the first big improvement in tap connectors in many years.

Its unique design not only gives greater mechanical strength — more contact area and more pressure, but also keeps the connector under constant spring tension. As a result contacts are better, wires can't work loose and "burnouts" are practically eliminated.

## Easier to Stock!

ONLY THREE SIZES are needed for all combinations from two No.1 wires to one No.10 and one No. 12 or one No. 8 and one No. 14. Connectors are available *without* spacer bars for copper-to-copper or aluminum-to-aluminum, *with* spacer bars for copper-to-aluminum, copper-to-steel or aluminum-to-steel.

## Easier to Use! JUST ONE UNIT!

No Parts to come loose

1. Place IDEAL Tap Connector on Main
2. Close Connector
3. Insert Tap, Tighten with a Wrench

**Costs Less!**  
The IDEAL Tap Connector is lower in price than other connectors for practically every combination.

**Sold Through Leading Distributors**

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Please send catalog data on IDEAL Tap Connectors

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Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



## Service Equipment On Yard Pole and Building Wall

**Q.** I am about to wire a rural farm house. The supply authority granted permission to install an outdoor service and meter on a yard pole. With the usual weather cap and entrance conduit on the house, I was going to have it come into a combination range panel cabinet or cutout box as the service switch will be outside on the meter pole. Is this approved or would I have to have the service conduit on the house come into an isolation switch beside the panel?—L.L.

**A.** Assuming that the service switch installed on the yard pole does not contain fuses, it appears to me that all of the Code rules applying to services, as covered by Article 230, must be satisfied. As a result the conductors from the pole to the house, according to Section 2304-b, are considered as a service drop and must be installed accordingly. Section 2351 covers the disconnecting means required for service entrance conductors and requires the switch or circuit breaker used to be of a type approved for service equipment and for prevailing conditions. This switch could be either inside or outside the building wall and according to Section 2351-d which covers properties comprising more than one building under single management could be located on the yard pole. Section 2371 covers the Code requirements for the service overcurrent device and Section 2372 requires such a device to be an integral part of the service disconnect means or to be located immediately adjacent thereto. It therefore follows in the case presented that the Code would not, in my opinion, recognize the service disconnect at the yard pole with the service overcurrent device in the house.

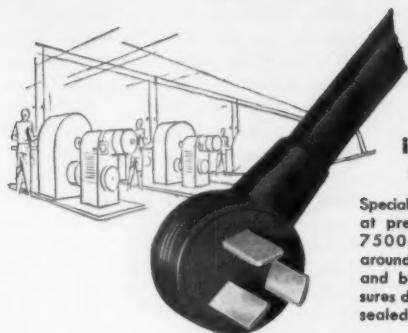
As a result of these rules, it appears clear to me that the service equipment at the house must satisfy all Code rules pertaining to services regardless of the switch at the pole. Your proposal to use a combination range and service device which incorporates a switch and a fuse would satisfy the Code provided it was approved for service use. The use of a cutout box alone would be in violation of the Code even though it did contain the main service fuses. As previously covered, Section 2372 does not permit the switch to be at the pole and the overcurrent device in the house. The use of an isolating switch at the house also would violate Code

# THERE IS A "RIGHT" CORD

## For Ranges and Dryers

It's a  
**PARANITE®**  
"SAFE" cord

and here's why

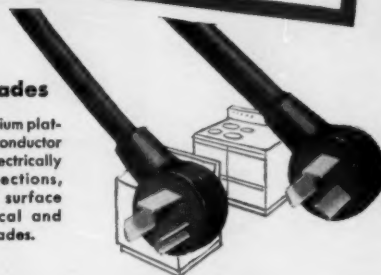


### Injection molded

Special rubber compound, at pressures exceeding 7500 p.s.i. forced around jacket, insulation and blade junctions insures dense permanently sealed rubber cap.

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Complete Cadmium plating, from tip to conductor crimp, assures electrically superior connections, better contact surface within receptacle and clean bright blades.



### 100% "cords" control

From rubber, compounded specially at the Paranite Mill, through stranding, insulating, injection molding, strain-reliefs, terminals, and tests, these cords are 100% inspected and UL approved.

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Insulation Resistance between conductors exceeds 32,500 meg-ohms. (50 meg-ohms standard). Dense molded cap insures exceedingly high dielectric strength properties.



It takes specially compounded rubber, precisely controlled equipment and close supervision to injection mold these 90° angle caps . . . but look at the results! You get a firm, dense and more uniform permanently molded cap that means complete customer satisfaction:

Cadmium plating of blades is another important "extra" you get with all PARANITE Range, Dryer and Appliance Cords . . . which assures a more de-

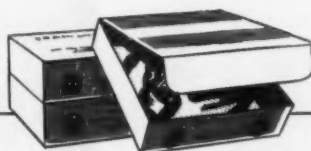
pendable and surer electrical contact.

PARANITE Cords give outstanding performance . . . Insulation Resistance of over 32,500 meg-ohms and extremely high dielectric qualities prove their superiority.

To perfect, manufacture and 100%-inspect cords of this calibre takes extra effort . . . but PARANITE "Safe" Cords have a reputation to maintain and they must be RIGHT!



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RP-1 2 #8-1 #10  
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separately packed in sturdy cartons

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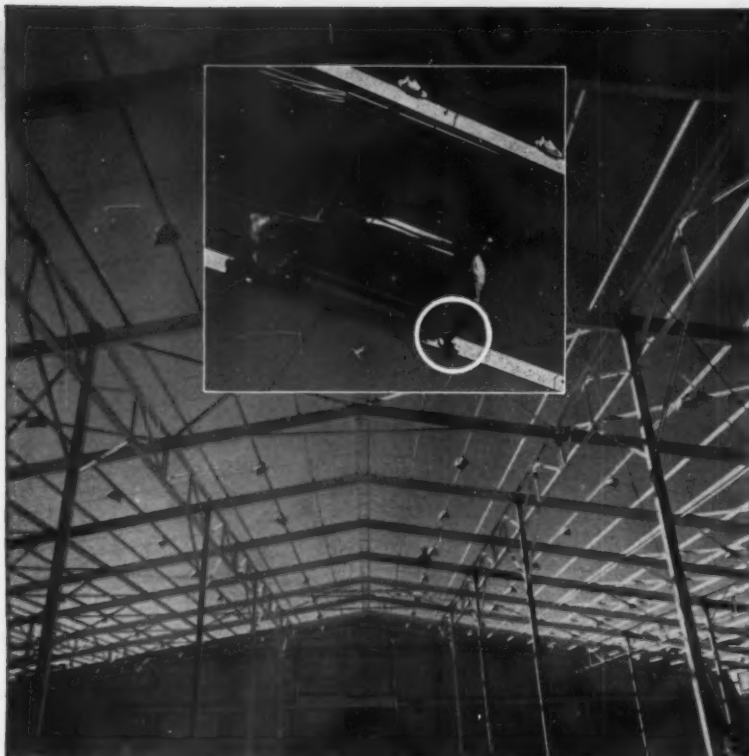
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\* Los Angeles, California, 2240 East Washington Blvd.  
\* Minneapolis, Minnesota, 5407 Excelsior Boulevard  
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Upper Darby (Philadelphia) Pa., 6816 Market Street  
Rochester, New York, 207 Powers Building  
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## Tough fastening job made easy... costs reduced and time saved with high-speed *Ramset System*

Some 40,000 fastenings were required to install conduit and overhead lights in the warehouses of the Naval Air Station at Alameda, California.

Instead of welding or drilling holes for bolts, operators rolled along on movable platforms and anchored  $\frac{3}{8}$ " steel angle plates with light, easy-to-use RAMSET JOBSTASTERS and Tru-Set drive pins. Fixtures were then hauled up and fastened to the plates. Each bay of the 800-foot-long warehouse was completed in less than four days. The work was done far faster and at much lower cost than would have been possible

with conventional methods, and scaffolds were eliminated.

The speed, ease and economy of RAMSET SYSTEM "pays off" on almost any kind of anchoring into steel or concrete. Reducing time up to 90% and cutting costs up to 75% are day-by-day experiences of thousands of electrical contractors and maintenance men, many of whom have been profiting from RAMSET SYSTEM for five years or more.

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**Ramset Fasteners, Inc.** Ramset Division,  
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**FIRST IN POWDER ACTUATED FASTENING**



requirements since the service switch must have an interrupting capacity. An isolating switch has no interrupting rating. See definition under switches.—B.A.McD.

### Tap Between Junction Box and Fixture

**Q.** We are rewiring an existing building in which they are placing a false ceiling below the present ceiling and they wish to install recessed lighting fixtures in this false ceiling. As some of the runs from the distribution cabinet are rather long, we plan to use No. 10 wire fused at 20 amperes for the circuit conductors with junction boxes placed in the thin wall runs within reach of the recessed openings at each fixture. Will the Code permit us to use a No. 14 AVA type wire tap between this junction box and the fixture, or must we use a No. 12 wire inasmuch as we are fusing the circuits at 20 amperes?—V.A.P.

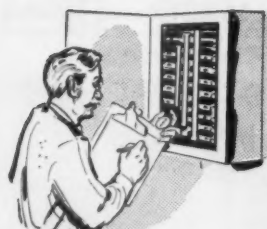
**A.** Under paragraph c. of Section 2434, you will find that on a tap not over 5 feet long it need not have the current carrying capacity of the wire supplying it provided its current carrying capacity is sufficient for the load supplied.

Therefore, if the tap between the junction box and the fixture is kept under this 5-foot limitation, any conductor having insulation suitable for the maximum temperatures obtained and carrying capacity sufficient to supply the demand load would comply with Code requirements.—G.R.



**LEE HARVILL**, the guiding force behind Harvill-Byrd Electric Co., Little Rock, Arkansas, has played a major role in the development of the electrical contracting industry in the Little Rock Area. His firm is actively engaged in a wide range of electrical construction projects.





# PIONEERING

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Your best guarantee of Economy Fuse Leadership is Economy's record of nearly a half-century of pioneering.

Economy Renewable Fuses were the First to be approved by Underwriters' Laboratories, Inc. Economy introduced the first major improvement in the Clearsite\* Plug Fuse that "shows when and why it blows". Economy pioneered, developed and continually improved such popular fuses as Arkless\* Mechanical Indicating One-Time Cartridge, Eco\* One-Time Cartridge and Renewable Plug.



### "ECONOMY DELAY"\* RENEWABLE FUSES ①

Economy was the First to use inexpensive, bare, renewal links for restoration of blown fuses to their original efficiency, and to offer "Economy Delay" Renewable Fuses and Renewal Links, a favorite with industry since 1911.

### ECON\* DUAL-ELEMENT FUSES ②

Recently Economy announced the new Econ Dual-Element Cartridge Fuses for controlled protection against unnecessary blowouts and against short circuits, thus rounding out a complete line of "fuses for every purpose".

WRITE FOR BULLETINS on the type fuses in which you are interested.

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**ECONOMY**

fuses for every purpose

Your Electrical Wholesaler  
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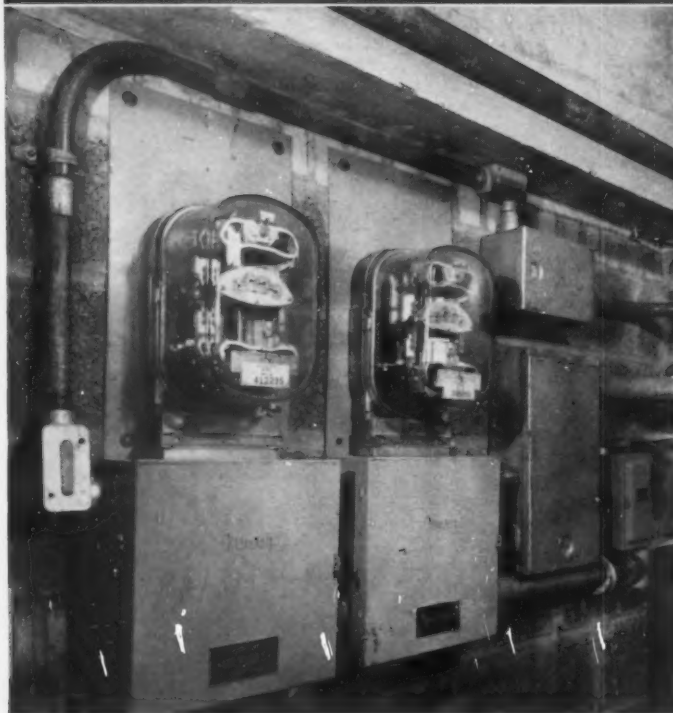
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Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

●The new Health Insurance Plan Clinic in the Upper Manhattan Medical Group Building, New York City, is another modern structure in which the electrical wiring is given sure protection of Youngstown Buckeye Conduit. Standard-threaded rigid steel conduit, of which Youngstown Buckeye is the leading brand, is the only wiring system approved by the National Electrical Code as moisture, vapor, dust and explosion proof in hazardous locations.

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# In The News

## Maintenance Conference and Show Held in Los Angeles

The industrial growth of the West Coast received new recognition when the First Western Plant Maintenance Conference and Show was held in Los Angeles July 13, 14, and 15.

Some 250 maintenance men from throughout the 11 Western states attended two days of conference sessions focused around problems of industries characteristic of the area—notably food processing, aircraft, petroleum, and metal working.

Concurrent with the conference, held in the Ambassador Hotel, was a maintenance exhibit in the Southern California city's Pan Pacific auditorium, where 8000 visitors inspected displays of 144 companies.

A general session, presided over by L. C. Morrow, consulting editor of *Factory Management & Maintenance*, opened the conference. Three speakers ranged over topics of broad interest to maintenance people.

Maurice Olchoff, plant engineer, Solar Aircraft Co., Des Moines, Iowa, in a speech "Principles of Maintenance Organization and Management" emphasized the importance of maintenance in the "Automation era"—an era that may see more maintenance men than production personnel in the plant. Olchoff detailed these means of increasing maintenance and efficiency: 1) defining responsibilities of maintenance; 2) controlling "Maintenance Behavior Qualities," 3) establishing a workable organization chart; 4) providing a creative atmosphere for the workers; 5) providing a workable maintenance program.

George J. Martin, manager, mechanical division, National Biscuit Company, New York, spoke on "Planning and Scheduling Maintenance Operations." He compared modern maintenance organizations of rapidly expanding Western industries—developed since World War II—with maintenance operations in older plants.

Martin emphasized functions of proper planning and scheduling in a preventive maintenance program, adding that "qualifications of maintenance crews and their make-up is an important phase of planning and scheduling. Maximum production cannot be obtained without first getting maximum efficiency from your maintenance operations."

J. M. Forrest, superintendent, maintenance and construction, The Dow



**PANELISTS** at the First Western Plant Maintenance Conference discussing Maintenance of Electrical Equipment are (left to right) Byron Hill, Cannon Electric Company; Philmore Belsky, Westinghouse Electric Corp.; James Roy Jones, Westinghouse Electric Corp.; L. A. Beck, General Electric Company.

Chemical Company, Pittsburg, Calif., reported his company's success with a 2½-year training program in his speech "Training People for Maintenance Work." Text for the course, he said, has become a "working library for the craftsman." Three broad areas are covered: 1) safe and proper use of hand and power tools; 2) use of blueprints and bills of materials; 3) necessary technical know-how, safety conduct, and plant standards to properly complete the job.

After the general session, the conference broke up into specialized roundtables. There were eight of these altogether, dealing with such topics as inspection procedures and frequencies, small plant maintenance, maintenance in aircraft and metal-working industries, and lubrication and preventive maintenance.

Of special interest to electrical maintenance of electrical equipment led tractors was a discussion on main- by Byron Hill, plant engineer, Cannon Electric Company, Los Angeles.

L. A. Beck, manager, Southwest Pacific District Service Shop, General Electric, Los Angeles, Calif., underlined productive maintenance, which he described as "creating added output without adding any machines," as the present requirement of increased production at lower cost. He said maintenance must be given a position equal to production if the facilities are to be kept running. "When machines arrive at 'old age', too often it is not the maintenance department at fault—it is management."

J. Roy Jones, regional engineer, Westinghouse Lamp Division, Westinghouse Electric Corp., Los Angeles, described a simple program to improve

lighting performance and reduce costs: systematic cleaning and group replacement of lamps. Since fluorescent illumination diminishes with age, Jones pointed out, "the average lumination level is automatically raised when lamps are discarded before burnout."

Philmore Belsky, Switchgear Product Engineer, Westinghouse Electric Corporation, Los Angeles, talked on "Maintenance of Electrical Distribution Apparatus." He outlined a program of field maintenance for air and oil circuit breaker clad switchgear, low voltage metal enclosed switchgear, and dry and liquid filled transformers. "Such maintenance can be designated as preventive maintenance when it is performed often enough so that repair work on the equipment is not found to be necessary or serious."



**CHARLES F. ZWEIFEL**, vice president of Charles F. Zweifel & Co. Inc., electrical contractors of New York City, recently completed illuminating the new elevated highway linking Manhattan's Franklin D. Roosevelt Drive and East River Drive.

# MODERNIZING LIGHT AND POWER CIRCUITS

## LOW-COST REMOTE CONTROL SWITCH INSTALLATION

Outdated electrical circuit systems are at the top of the list in industry modernization programs. ASCO Remote Control Switches—designed for simple, low-cost installation on panel boards and switchboards and for separate installation on sub-panels—provide accessible and convenient control of lighting and power circuits.

ASCO Switches may be actuated by pushbuttons, a time switch or similar devices—are ideal for use in factories, schools, show windows, hotels, theatres, airports and drive-ins.

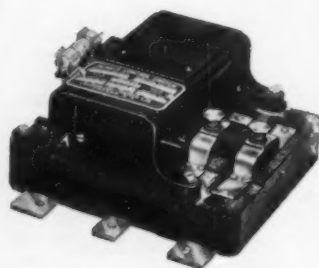
### ADVANTAGES

**Installation Economy**—Distribution panels can be located to provide straight feeders and short branch circuits, resulting in minimum line drop and losses.

**Control Convenience**—Control stations located conveniently—connections made using small wires provide instant disconnect of lighting and power feeders.

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ASCO 920 Remote Control Switches have been granted Underwriters' Laboratories approval for use at 600 volts AC, 250 volts DC. Switches may be fused for added protection and convenience.

Write us, outlining your specific switch problem—or mail the coupon below for complete catalog information on ASCO Switches.

**AUTOMATIC SWITCH CO., 385Q Lakeside Avenue, Orange, New Jersey**

Rush me catalog information on ASCO Remote Control Switches.

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## Automatic Switch Co.

385Q LAKESIDE AVENUE,

ORANGE, NEW JERSEY



**SHOP EFFICIENCY** expert and a handy man with a slide rule is engineer Cecil R. Medsker, manager of the motor repair department at Miller-Seldon Electric Company in Detroit.

## St. Paul Contractors Spearhead Formation Of All-Industry AW Committee

Formation of an All-Industry Adequate Wiring Committee in the Twin-Cities area resulted from a meeting called by William Collins, Jr. (Collins-Hegberg Electric Co.) of the St. Paul Electrical Contractors Association. The new committee will function through the North Central Electrical League, Inc., in Minneapolis, to implement educational programs and promotion activities stressing the need of Adequate Wiring in new homes and rehabilitation of wiring systems in older homes.

The following industry leaders were named by their respective groups to serve on the committee:

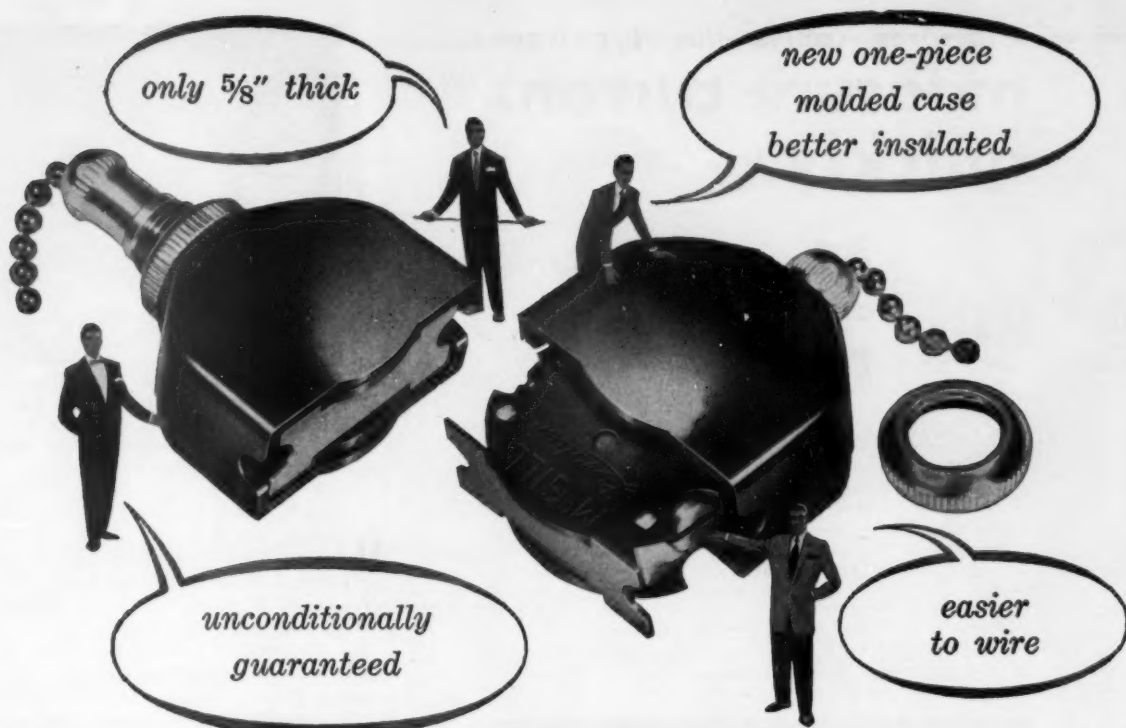
**Electrical Contractors**—Fred Garling, Sterling Electric Co.; William Collins, Collins-Hegberg Electric Company.

**Electrical Inspectors**—S. Martin



**ELECTRICAL ESTIMATING** is a subject close to the heart of Raymond Camus who, with his dad, Frank Camus, heads up extensive electrical construction work of C & C Electric Co., Shreveport, La.





**now unconditionally guaranteed no. 41 *Levolver*® switch improved with new one-piece phenolic case**

You can save money by specifying the Model 41 Levolver Switch because its use eliminates the need of replacement and reduces maintenance costs. It is the only switch unconditionally guaranteed against failure in lighting circuits. And now the Model 41 has a new rugged one-piece molded Phenolic case that provides better insulation and makes wiring easier and faster. Requires only removal of mounting nut to slip mechanism out of case and wire easily accessible terminals. Insert in case, slip lever through mounting means and replace nut. It is a 6 amp, "T", 125 volt; 3 amp, 250 volt switch, only  $\frac{5}{8}$ " x  $1\frac{3}{8}$ " x  $1\frac{3}{8}$ ". The No. 41 insures dependable lifetime service for conduit box and canopy mounting, incandescent or fluorescent lighting and for FHP motor control. *Underwriters' Laboratories Inspected.*

Send for the new McGill Catalog No. 49-A describing the full line of Levolver Switches, Sockets and Lamp Guards.



**McGILL MANUFACTURING COMPANY, INC.**  
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## measure current quickly

**Both** } **AC and DC**

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### TONG TEST

- Only Tong Test can measure both AC and DC by snapping tongs around electrical conductor. Readings are taken instantly and accurately without breaking circuit or insulation.

- Interchangeable scale ranges up to 1000 amperes AC or DC.



### AMMETER

- Safe, convenient, light weight. Cannot burn out as there are no windings.

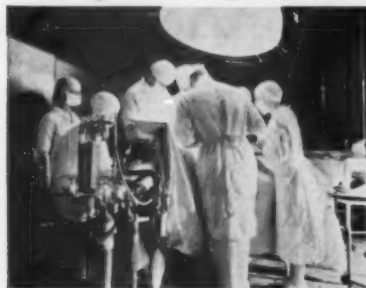
- Voltage readings up to 600 volts AC or DC with the Voltor attachment.

- Five types to accommodate cables up to 3 7/8", bus bars up to 4 1/2" x 1/2".

Write for Tong Test Bulletin CM-400

**COLUMBIA ELECTRIC MFG. CO.** 4541 HAMILTON AVE. CLEVELAND 14, OHIO

## Safeguard against shock and Spark Hazards



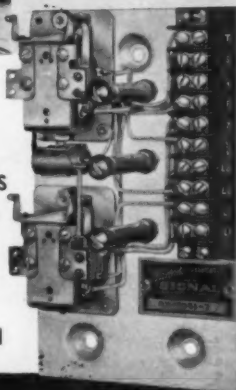
### GROUND DETECTOR RELAY

FOR UNGROUNDED EQUIPMENT  
IN HOSPITAL OPERATING ROOMS

Recommended  
**SAFE PRACTICE**  
OF THE

National Board of Fire Underwriters  
FOR  
**HOSPITAL OPERATING ROOMS**

AS RECOMMENDED BY THE  
NATIONAL FIRE PROTECTION ASSOCIATION



ENGINEERING  
REPRESENTATIVES IN  
PRINCIPAL CITIES.

*Wheelock*

**RELAYS  
SIGNAL**  
ENGINEERING & MFG. CO.  
LONG BRANCH, NEW JERSEY



**ELECTRICAL PIONEER**, Mrs. Anna M. Fagan, wife of the founder of Fagan Electric Co., Little Rock, Arkansas, is today still active as treasurer of this large electrical contracting firm.

Streed, Chief Electrical Inspector of Minneapolis.

**Electrical Workers**—Joseph F. Krech, Local 292, IBEW, Minneapolis; Charles R. Brett, Local 110, IBEW, St. Paul.

**Electrical Wholesalers**—Charles F. Woods (committee chairman), General Electric Supply Co.; Jack Vilett, Northland Electric Supply Company.

**Electrical Manufacturers**—Harold Coleman, General Cable Corp.; Robert A. Nelson, Pass & Seymour, Inc.

**Electric Utilities**—J. Roscoe Furber, Northern States Power Co.

A sub-committee consisting of the contractor, electrical worker and inspector members are formulating a package wiring plan. Another sub-committee consisting of Messrs. Vilett, Nelson, Furber, Collins and Garling will develop a time-payment financing plan for rewiring jobs.

Already the committee has recommended the purchase and showing of an Adequate Wiring TV film strip produced by the Electrical League at San Francisco to "kick-off" the over-



**THE GANG** from Walter J. Barnes Electric Co., running the job at Desire Street housing project, New Orleans, La.: (L-R rear) R. Loosemore; L. Macaluso; S. Bennett, superintendent; (L-R front) P. Chuter; A. Eanglehart and R. Spiehler.

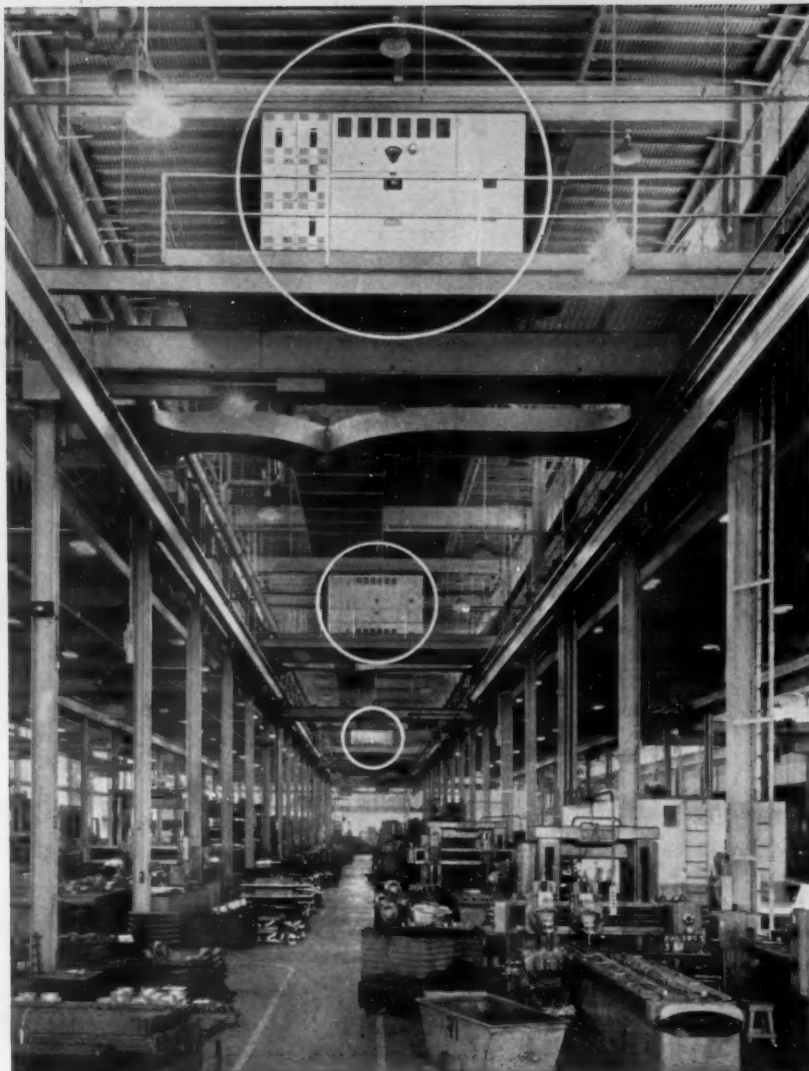
# *This is how*

THE GOSS PRINTING  
PRESS CO., Chicago  
obtains

## *efficient distribution*

of electric power with  
high voltage feeders  
to load centers,  
and also

## *saves floor space*



*This was accomplished with*

### **SORGEL Dry-Type Transformers,**

compactly incorporated into substations, all self-contained, safety enclosed in steel, complete with primary switchgear and secondary circuit breakers, and installed above floor level.

The installation consists of five 500 Kva and two 300 Kva, 3-phase, 4160 volt to 480 volt substations for power, and 13 dry-type transformers, sizes 10 to 50 Kva, 3-phase, 480 volt to 120/208 volt for lighting and portable equipment.

This saved The Goss Printing Press Co. thousands of dollars over a low voltage dis-

tribution system, and provided them with the efficiency that only a high voltage distribution can provide.

Again the ingenuity of an owner, his architects, and consulting engineers, combined with SORGEL expert engineering, resulted in a most modern, flexible, space-saving and efficient electric distribution system.

By using SORGEL dry-type transformers in substations, all vaults have been eliminated, and by installing the substations overhead, more floor area was made available for production.

*Architects — Olsen & Urbain*

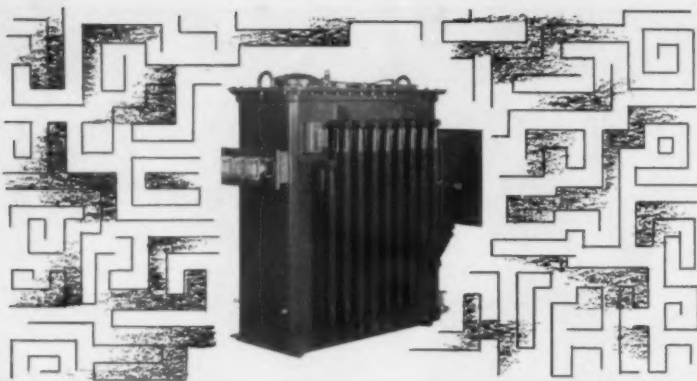
*Engineers — Neiler, Rich & Bladen*

*Electrical Contractor—The Edward Electric Co.*

**Sales Engineers in Principal Cities**

**SORGEL ELECTRIC CO., 836 West National Ave., Milwaukee 4, Wis.**

*Pioneers in the development, manufacturing and application of dry-type transformers—for 40 years.*



Let *Standard* Engineers untangle your transformer problems....

IT'S NOT EASY to arrive at the solution to a particularly difficult transformer problem. However, when you have the able assistance of experienced STANDARD engineers the solution becomes easier and complete. Don't wrestle with your transformer problem any longer. Call STANDARD today!

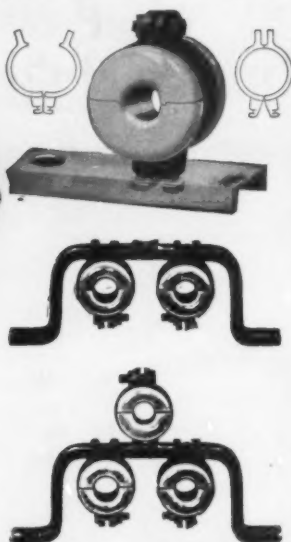
**Standard**  
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO  
REPRESENTATIVES IN PRINCIPAL CITIES

For QUICK, EASY, SAFE  
Cable Installation  
**"EFFICIENCY"**  
NESTED  
CONDUCTOR RACKS

Efficiency Nested Conductor Racks are simple, compact and are scientifically designed to carry conductors equidistant from center to center. One bolt supports the bushings, and clamps the bushing support to the frame. Available in 2-3-4-5- and 6-bushing racks.

Write for Catalog 38-A



**Efficiency**  
ELECTRIC AND MANUFACTURING CO.  
EAST PALESTINE, OHIO

MANUFACTURERS OF EFFICIENCY  
ELECTRICAL DEVICES FOR CONDUIT,  
WIRE AND CABLE SUSPENSION

**"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION**



**EXECUTIVES** of Nager Electric Co., Inc., of Brooklyn, N. Y., look over plans of Brooklyn College's two new modern theater buildings as electrical work on the project nears completion. Seated (l. to r.) are Jordan Nager, president; Gerald William, vice president, and Norman Lichtenstein, vice president.

all promotion. An AW booth in the Electric Farm and Home Exhibit at the 1954 Minnesota State Fair was approved at the initial committee meeting.

## NCEI Changes Name

North Central Electrical League is the new name of the North Central Electrical Industries, Inc., at Minneapolis, Minnesota. The new corporate name was selected because the Board of Directors considered the term "league" more descriptive of the organization purpose than the word "industries".

The NCEL is a coordinating organization embracing all phases of the electrical industry in Minnesota and adjoining states.



**THREE OF DETROIT'S** top-notch electrical contractors discuss electrical modernization possibilities. They are: (L to R) A. G. Offenstien; C. Robert Howard, Howard Electric Co.; and H. L. Hauschild, Hydron-Brand Company.





## Cut fastening costs up to 80% on heating and air conditioning installations...with the REMINGTON STUD DRIVER

"It saves us money on every fixture we install"—that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every

way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

**What's your fastening job?** Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut your fastening costs, just send in the coupon below.

### QUESTIONS YOU ARE ASKING

#### QUESTION:

What are the studs made of?

#### ANSWER:

Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

"If it's Remington—It's Right!"



**Remington** **DUPONT**

Listed & Approved by Underwriters' Laboratories, Inc.

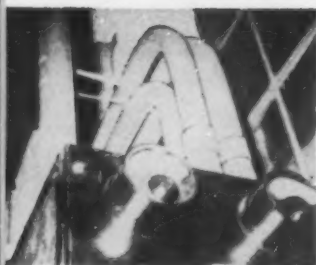
### MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. E.C.M.-9  
Remington Arms Company, Inc.  
Bridgeport 2, Connecticut

Please send me free copies of the new booklets showing how I can cut my fastening costs.

Name \_\_\_\_\_  
Position \_\_\_\_\_  
Firm \_\_\_\_\_  
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City \_\_\_\_\_ State \_\_\_\_\_





By making 12 90° bends in 1" conduit with a TAL ONE-SHOT BENDER instead of using elbows and couplings, time was cut from 59 to 39 hours... \$134 was saved on labor and material on installation of a 250 hp, 220 volt, 3-phase air compressor in the shop of the Diamond T Motor Car Co., Chicago. This was possible only because a TAL ONE-SHOT completes bends in one setting—no shifting of pipe is necessary!

• 20 hours in time  
• \$64 in materials  
**SAVED ON ONE JOB  
WITH A TAL  
PORTABLE BENDER**

by the  
**Johnson Electric Co.**  
Chicago



### COMPLETE LINE OF BENDERS

- For pipe up to 8"
- For copper and thinwall tubing.
- 6-Way Hickeys — do what others can't do.

## TAL 6-WAY BENDER

WITH

- EXTRA STUB HOLE
- SIX WAY NON-SLIP SHORT BENDING JAWS for close quarters or open slab work. Non-Slip, Accurate, Rapid and Easy Bending.
- SAFETY NECK for SURE GRIP.



Sizes	Price Each	Pkg. Price of Ten
1/2"	\$3.70	\$3.10 ea.
3/4"	4.65	3.90 ea.
1"	7.95	6.65 ea.

**TAL BENDER, INC.**

DEPT. 21 • MILWAUKEE 2, WISCONSIN



**FATHER and SON** combination in Athens, Ga., is Owen M. Roberts, Jr., and O. Mortimer Roberts, who own and operate the Roberts Electric & Appliance Co. Son Owen supervises personnel and follows job projects, while "Mr. Roberts" (that's how Owen always refers to his dad), a professional engineer, does the estimating, engineering, and job planning. Rewiring old buildings for air conditioning is currently a healthy part of their business.

## REA Promotes Electric Use on Farm

A program to step up the use of electricity in rural areas by increasing load-building activities on the state level was announced recently by the Inter-Industry Farm Electric Utilization Council. The Council is the outgrowth of a temporary "Power Use Steering Committee" formed during an electric sales conference in Chicago, March 11. This conference was sponsored by the Rural Electrification Administration.

The program will be launched at a series of five area meetings across the country this fall at which the plans and methods for statewide power-use activities will be presented to electric appliance and farm equipment distributors, electric companies, rural electric cooperatives and other interested groups. The IIFEU Council plans to announce dates for the area power-use meetings soon and invites inquiries regarding them.

Representing rural electric cooperatives, electric companies, and electric appliance and equipment manufacturers, the steering committee formed a permanent group under the name Inter-Industry Farm Electric Utilization Council. The Council operates under the broad objective of increasing the efficient use of electricity in rural America through the coordination of national and state load-building programs. Support for the work of this Council has been pledged by several national organizations representing the industries concerned. Council members are:

# ILSCO

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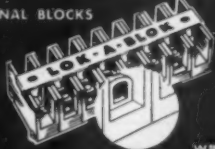
60, 100 & 200 AMPS.

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MANY SIZES AND TYPES

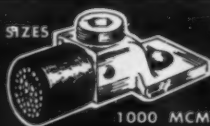
TERMINAL BLOCKS



WRITE FOR 80-PAGE CATALOG

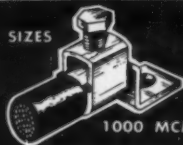
ILSCO 5741 MARIEMONT AVE., CINCINNATI 27, OHIO

LO 7 SIZES



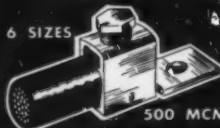
1000 MCM — 14

SLU 11 SIZES



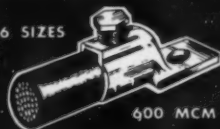
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XT 6 SIZES



500 MCM — 14

VT 6 SIZES



600 MCM — 14

MU 3 SIZES



500 MCM — 6



**"UP IN THE AIR"**

**on plant expansion**

**when existing**

**circuits are**

**loaded**



# **ROCKBESTOS AVC<sup>®</sup>** (N.E.C. TYPE AVA)

**WIRE AND CABLE  
is your solution**

How to get added electrical capacity to take care of needed additional plant facilities has many a production man "up in the air".

A good solution for increasing your current capacity 30 to 50% is to re-

place your present wire and cable with Rockbestos A.V.C.

Why not have a Rockbestos Wire Specialist give you the complete story?

Phone or write the nearest branch office, today.



**STOCKED  
COAST TO COAST**

Standard Rockbestos A.V.C. (N.E.C. types AVA, AVB, etc.) are available from stock for immediate shipment. Call or write nearest branch office.



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OAKLAND, CALIFORNIA • SEATTLE

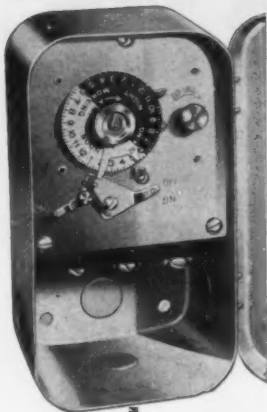
## NEW LOW-COST TIME SWITCH With Higher-Priced Features

### RELIANCE MODEL "400"

Reliance engineering has designed a time switch, with all the dependability and convenience of automatic circuit control, at low cost. The new Reliance Model "400" has the features and quality of many higher-priced switches.

#### Check These Features

- Precision gear train
- Standard, heavy-duty motor
- Motor gears oil-sealed for lifetime lubrication
- Pit resistant silver-to-silver contacts
- One-piece deep-drawn steel case.



Type 401 S.P.S.T.  
20 Amps.—125 Volts

## RELIANCE TIME SWITCHES

Send for **FREE** catalog

RELIANCE AUTOMATIC LIGHTING COMPANY  
1937 Mead St. Racine, Wis.

# RAKIT®

## QUICK MOUNTING BRACKETS

### SIMPLIFIED SUPPORTING STRUCTURES



The new one-piece RAKIT Brackets have been specifically designed for quick and easy installation without nuts, bolts, or other fastening devices.

#### JUST A TWIST OF THE WRIST

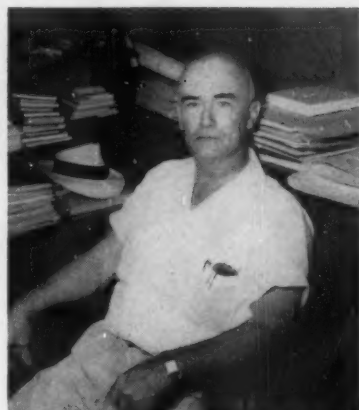
There's no slipping or falling out.

These brackets are ideal for the support of items such as cable trough, instrument tubing trough, conduit, pipe, cable and many others.

The savings in assembly time and labor made possible by this one-piece RAKIT Bracket assure "better support for less cost". Write today for further information. Ask for bulletin 9M.

## RAKIT CORPORATION

711 SOUTH 50th STREET • PHILADELPHIA 43, PA.



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NEVER SPLICES need be made when you run "all purpose" Durasheath. It can be run buried, overhead, in ducts . . . in one continuous run.

## New trend in industrial wiring: Neoprene jacketed cable

Workers find this tough, long-lasting "premium" cable usually costs little more to use . . . then cuts upkeep.

A chemical plant in Texas uses ANACONDA Durasheath\* neoprene jacketed cable as building wire for lighting and heating. A plant in St. Louis uses it, too. Another in Chicago.

The practice of using versatile Durasheath for building wire has caught on from coast to coast. And there's good

reason: Durasheath cable costs little more to use than the cheapest cable you can buy—

and more than makes up this difference in long trouble-free service, lower maintenance costs!

Durasheath's tough jacket is made of specially compounded neoprene. It shrugs off heat, moisture, corrosive fumes. And it takes rough handling in stride. As demand for electricity rises, Durasheath provides added reliability.

Industry engineers call Durasheath "good insurance." And it is!

Durasheath comes in all sizes, single and multiple conductor, copper and aluminum from 600 to 15,000 volts. You can run it in the ground, overhead, in damp ducts in *one continuous run* with minimum splicing. Want more information? See your Anaconda Representative or write **Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.**

\*Reg. U. S. Pat. Off. 84987

Durasheath neoprene jacketed cable

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CARBIDE-TIPPED

## MASONRY BITS

Yes — ANY kind of masonry from plaster to hardest concrete and granite. There's a New England Carbide-Tipped Masonry Bit for every size hole from 1/8" to 6" for either rotary or hammer drills; to do the work **EASIER**, to make more uniform holes and — to do it **FASTER**.

**THE ONLY COMPLETE LINE OF MASONRY BITS IN THE WORLD**



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*Cyclo-twist*

For **ROTARY** drilling of soft and medium hard masonry. Sizes 1/8" to 1 1/4".

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For **ROTARY** drilling of hardest masonry including hard concrete and vitreous tile. Sizes 1/4" to 6".

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For **HAMMER** drilling of all hard masonry and granite. Spiral and vertical dust removing flutes. Sizes 3/16" to 1 1/4".

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For **HAMMER** drilling of all hard masonry and granite. Fast, uniform holes. Sizes 1 3/16" to 5".

At your local hardware or mill supply houses or write direct to:

**NEW ENGLAND CARBIDE TOOL CO., INC.**

60 N. Brookline St., Cambridge 39, Mass.



**TOM C. METCALFE**, Metcalfe Electric Co., Ft. Worth, Texas, looks over some of the details of the electrical job now nearing completion on the new Ft. Worth Children's Museum.

In discussing the need for accurate market information for use at the local level, the Council endorsed a proposed publication to deal with the reasons and methods for making market surveys. The Council also agreed to aid in the distribution of the publication and to place publicity for it.

Among guests attending the July 20 meeting were representatives of the National Electrical Contractors Association who presented their views on the problem of adequate wiring. The Council considers this matter one of the most pressing problems in the power-use program at present. Agreement was reached which will lead to future cooperation between the Council and NECA in studying methods for improving farm and home wiring.



**ELLIS M. FAGAN**, energetic president of Fagan Electric Co., progressive electric contracting firm of Little Rock, Arkansas is shown here looking over an issue of "Electrical Construction and Maintenance." His firm is handling a large share of electrical construction and expansion for the rapidly growing aluminum industry in Arkansas.

*the Emblem of Quality since 1875*

**FARADAY**

**No  
Confusion  
here...**

There's order in this plant—and in the many, many other factories and offices equipped with Faraday signals and systems. They stop confusion and save steps, paging and signaling clearly and faithfully, day-after-day, year-after-year.

For generations, Faraday engineers have designed bells, buzzers, horns, chimes and complete systems to meet an endless variety of signaling needs and sound level requirements.

Consult your electrical wholesaler for details on the complete Faraday line.

**NECK-TYPE BELLS**

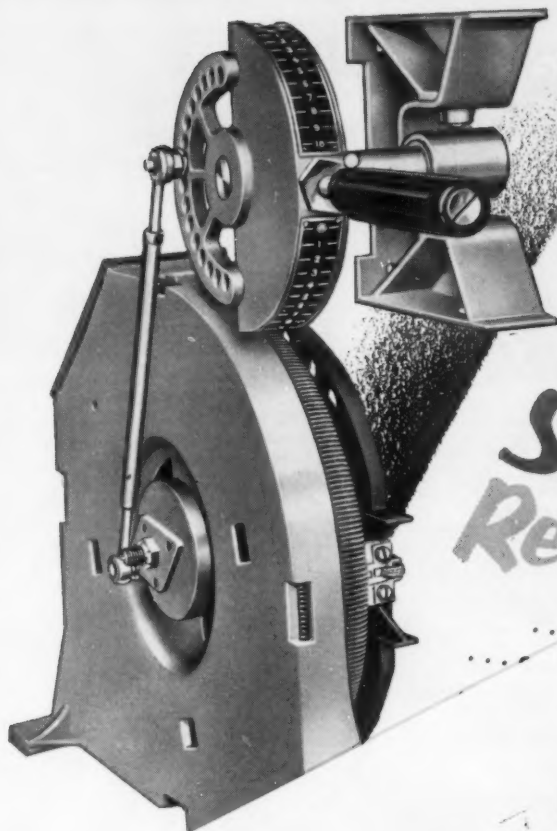
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What's more,  
burned out bearings,  
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and begin to realize  
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**SAFE**  
flame for hard-to-get  
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**5-in-1 OUTFIT**

Easy to handle in any location. No liquid fuel to spill. No fumes, soot, smoke, or stain. One handy kit with a flame for every job. See your LINDE Jobber or write to LINDE AIR



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Manufacturers of: Powerstat Variable Voltage Regulators • Voltbox A-C Power Equipment • Varicell D-C Power Supplies

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ANCE . . . SEPTEMBER, 1954

## NEW LOW-COST TIME SWITCH With Higher-Priced Features

### RELIANCE MODEL "400"

Reliance engineering has designed a time switch, with all the dependability and convenience of automatic circuit control, at low cost. The new Reliance Model "400" has the features and quality of many higher-priced switches.

#### Check These Features

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Type 401 S.P.S.T.  
20 Amps.—125 Volts

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Send for **FREE** catalog

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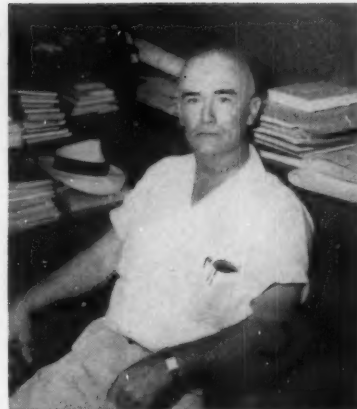
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\*Reg. U. S. Pat. Off. 643957

Durasheath neoprene jacketed cable

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kind of  
**MASONRY**

**NEW ENGLAND**  
CARBIDE-TIPPED  
**MASONRY BITS**

Yes — ANY kind of masonry from plaster to hardest concrete and granite. There's a New England Carbide-Tipped Masonry Bit for every size hole from 1/8" to 6" for either rotary or hammer drills; to do the work **EASIER**, to make more uniform holes and — to do it **FASTER**.

**THE ONLY COMPLETE LINE OF MASONRY BITS IN THE WORLD**

**Cyclo-twist**  
For **ROTARY** drilling of soft and medium hard masonry. Sizes 1/8" to 1 1/2".

**Cyclo-Core**  
For **ROTARY** drilling of hardest masonry including hard concrete and vitreous tile. Sizes 1/4" to 6".

**Thunder-twist**  
For **HAMMER** drilling of all hard masonry and granite. Spiral and vertical dust removing flutes. Sizes 3/16" to 1 1/4".

**Thunder-Core**  
For **HAMMER** drilling of all hard masonry and granite. Fast, uniform holes. Sizes 1 3/16" to 5".

**FREE MASONRY BIT SELECTOR**  
Send for yours today.

At your local hardware or mill supply houses or write direct to:

**NEW ENGLAND CARBIDE TOOL CO., INC.**  
60 N. Brookline St., Cambridge 39, Mass.



**TOM C. METCALFE**, Metcalfe Electric Co., Ft. Worth, Texas, looks over some of the details of the electrical job now nearing completion on the new Ft. Worth Children's Museum.

In discussing the need for accurate market information for use at the local level, the Council endorsed a proposed publication to deal with the reasons and methods for making market surveys. The Council also agreed to aid in the distribution of the publication and to place publicity for it.

Among guests attending the July 20 meeting were representatives of the National Electrical Contractors Association who presented their views on the problem of adequate wiring. The Council considers this matter one of the most pressing problems in the power-use program at present. Agreement was reached which will lead to future cooperation between the Council and NECA in studying methods for improving farm and home wiring.



**ELLIS M. FAGAN**, energetic president of Fagan Electric Co., progressive electrical contracting firm of Little Rock, Arkansas is shown here looking over an issue of "Electrical Construction and Maintenance." His firm is handling a large share of electrical construction and expansion for the rapidly growing aluminum industry in Arkansas.

*the Emblem of Quality since 1875*

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**No Confusion here...**

There's order in this plant—and in the many, many other factories and offices equipped with Faraday signals and systems. They stop confusion and save steps, paging and signaling clearly and faithfully, day-after-day, year-after-year.

For generations, Faraday engineers have designed bells, buzzers, horns, chimes and complete systems to meet an endless variety of signaling needs and sound level requirements.

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BELLS · BUZZERS · HORNS · CHIMES · VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS



POWERSTAT DIMMER  
TYPE D6000H

# The Answer to Your Dimmer Switchboard Requirements

- ... simple mounting
- ... easy electrical connections
- ... individual or master control
- ... cool, efficient flickerless operation



Work with your switchboard builder — inform him of the advantages of POWERSTAT dimming.

## POWERSTAT INTERLOCKING Light Dimming Equipment

POWERSTAT INTERLOCKING Dimmers are the finest dimming equipment you can buy . . . for your new switchboard . . . or to add to your present board.

Like all POWERSTAT Dimmers, these are continuously-adjustable auto-transformers. They do not use

up power in wasteful heat. They transform it into the exact intensity of light you want. They are simple to install . . . inexpensive to maintain . . . easy to operate.

INTERLOCKING POWERSTAT Dimmers are available in 2500 and 6000 watt ratings. Get full details in Bulletin D754I. Send coupon today.



See the Superior Electric's Mobile Display when it is in your area.

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SUPERIOR ELECTRIC  
COMPANY**

6094 Demers Ave., Bristol, Conn.

Manufacturers of: Powerstat Variable Transformers • Stabiline Automatic Voltage Regulators • Voltbox A-C Power Supplies • Powerstat Light Dimming Equipment • Varicell D-C Power Supplies • Superior 5-Way Binding Posts

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'SMOOTHER FASTER REAMING'

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DESIGNED FOR USE WITH  
**P & R End Bell  
BEARING REAMERS**



Though the P & R Reamer Drive uses any type reamer, this new set of 33 spiral fixed reamers, covering all popular shaft sizes from  $\frac{1}{4}$ " to 1  $\frac{1}{16}$ ", meets the requirements for practically all fractional and small integral H.P. motors. At each fractional size, oversize and undersize, reamers are provided. For example; at  $\frac{1}{2}$ "—.4995, .5000 and .5005.

### CHECK THESE ADVANTAGES

- No Guesswork
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WRITE NOW FOR FULL DETAILS



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**SPEED! ACCURACY!  
SIMPLICITY!** The ultimate  
in precision bearing fitting

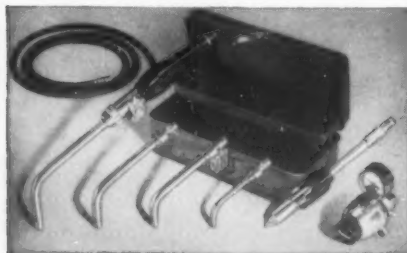
★ You Ream the average set of end  
Bell Bearings in 5 minutes or less

What's more, you eliminate misalignment,  
burned out bearings, improper bearing fit and  
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and begin to realize extra profit on every  
motor.

**SAFE**... controlled  
flame for hard-to-get-at  
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**Prest-O-Lite**  
Trade-Mark  
**5-in-1 OUTFIT**

Easy to handle in any location. No  
liquid fuel to spill. No fumes, soot,  
smoke, or stain. One handy kit with a  
flame for every job. See your LINDE  
Jobber or write to LINDE AIR



PRODUCTS COMPANY, a Division of  
Union Carbide and Carbon Corpora-  
tion, 30 E. 42nd Street, New York 17,  
N. Y. In Canada: Dominion Oxygen  
Company, Toronto.

Four stems and soldering iron handle  
every kind of work. Setup with MC Tank  
weighs as little as 13 pounds.

**Get it from your LINDE Jobber.**

The term "Prest-O-Lite" is a registered  
trade-mark of Union Carbide and Carbon  
Corporation.



**CHIEF ENGINEER** for Harman Electrical  
Construction Co., Dallas, Texas, is J. R.  
Williams, shown here looking over plans  
of the extensive electrical modernization  
job at the First National Bank in Dallas.

## Color Movie For Light's Diamond Jubilee Shown

"The Eager Minds", a 27-minute  
color film on electrical progress, had  
its premiere showing in New York  
early in August, on the occasion of  
its release by Light's Diamond Jubilee  
Committee for showings throughout  
the country this year in celebration  
of the 75th anniversary of Edison's  
invention of the electric light.

Produced for the committee by  
R.K.O., the movie presents both the  
past achievements and the future  
promise of electrical living in terms  
of the individuals who have made and  
will make contributions to it. Starting  
with Edison's invention of the light it  
comes through to such recent develop-  
ments as the solar battery announced  
by Bell Labs only a few months ago.

Some of the electrical devices shown  
in the picture are being presented on  
the screen for the first time.

Philip Bourneuf, the well-known  
television and stage actor, stars in  
"The Eager Minds," and Dwight  
Weist, noted radio and television com-  
mentator, is the narrator. Jay Bona-  
field produced the picture for R.K.O.  
Larry O'Reilly was director and cam-  
eraman and Burton Benjamin was  
writer and supervisor. N. W. Ayer &  
Son, agency for Light's Diamond Ju-  
bilee Committee, was in general charge  
of the production.

"The Eager Minds" was designed  
especially for non-theatrical showings  
by the companies and other organiza-  
tions of the electrical industry partici-  
pating in the Jubilee celebration. At  
the present time, these total more than  
300, and Jubilee activities are planned  
in more than 1,200 cities and towns  
throughout the country. Plans are  
now under way for showing the pic-  
ture in many of these places.



# Here's a new Sylvania LIGHTING SYSTEM!



*High-level over-all fluorescent light . . .  
and no visible fixtures . . . that's Sylvania's*

## SYLVAN-AIRE

This SYLVAN-AIRE System actually serves three purposes.

1. It provides a source of soft but ample over-all light.
2. Made of corrugated, translucent plastic, it imparts a new beauty and character to any room.
3. Designed with alternating acoustical strips or wedges to help hold sound to comfortable levels.

Quick, easy installation and extremely low maintenance costs are other big advantages. For new descriptive literature write to Dept. 4X-2409 at Sylvania.



Two views of SYLVAN-AIRE Lighting System in High Point, North Carolina Library.

### CONTRACTOR ACCLAIMS SYLVAN-AIRE!

"This SYLVAN-AIRE System opens up many new remodeling possibilities to Lighting Contractors," says George H. Dobbins, Jr., who handled this installation. "We also appreciate the simplicity of application, and the good business offered by this new system."

# SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . SEPTEMBER, 1954

205

NOW A

# Fully Automatic NURSES' CALL SYSTEM

with simplified installation and maintenance



- PLUG-IN COMPONENTS
- FACTORY WIRED CENTRAL CONTROL PANEL
- ROOM STATIONS FIT STANDARD OUTLET BOXES



While providing in a fully automatic system the most modern service available to hospitals, the NEW COUCH-CALL is also designed for simplified installation and maintenance.

Plug-in components in the central control panel are easily replaced by spares if necessary. Terminal strips in the central control panel provide for all external circuits. All internal circuits are pre-wired at the factory, and include system power supply. Room stations fit in standard outlet boxes. COUCH-CALL is ideal for both the hospital and the contractor. Write for Bulletin #126 giving complete details.

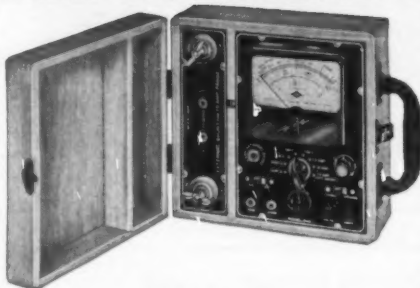
*Simplified Systems of Communication*

**Company, Inc.**

Private telephones for home and office . . . hospital signaling systems . . . apartment house telephones and mail boxes . . . fire alarm systems for industrial plants and public buildings.

NORTH QUINCY 71, MASSACHUSETTS, U. S. A.

## THE NEW MODEL 640 INDUSTRIAL ANALYZER



Provides all the measuring services required for maintenance, development, testing and repair work. Operates on a self-contained standard battery and is therefore always ready for use.

A single scale is used for making all voltage measurements—both A.C. and D.C. Unique circuit design results in close-to-perfect linear scale with no variation between A.C. and D.C. measurements. Thus, one scale is used for all voltage ranges!

### Specifications

A.C. Voltages: 0-15 volts	0-150 volts	0-750 volts
D.C. Voltages: 0-15 volts	0-150 volts	0-750 volts
Resistance: 0-1,000 ohms	0-10,000 ohms	
Current: 0-7.5 amperes	0-15 amperes	0-75 amperes

Comes housed in hand-rubbed oak cabinet. Absolutely complete including external shunt, one pair prod leads, one pair clip leads and detailed operating instructions. Only.....

**\$48.75**

### FEATURES

An accurately calibrated external shunt enables exact HIGH CURRENT measurements up to 75 amperes. Will measure the actual current consumption of any electrical device while the unit is in operation and without breaking any connections. To accomplish this, it is necessary only to plug the unit directly into the front panel receptacle of the Model 640.

**SHIPPED ON APPROVAL  
NO MONEY WITH ORDER—NO C. O. D.**

Try it for 10 days before you buy. If completely satisfied send \$8.75 and pay balance at rate of \$8.00 per month for 5 months.—**No interest or Carrying Charges Added.** If not completely satisfied, return to us, no explanation necessary.

Mass Electronic Distributing Co., Inc.  
Dept. D-66, 3849 Tenth Ave., New York 34, N. Y.  
Please rush one Model 640. I agree to pay \$8.75 within 10 days after receipt and \$8 per month thereafter.

Name .....  
Address .....  
City..... Zone.... State.....

## Students Win Lighting Awards

First, second and third prize awards were made recently to architectural students for their winning illumination design sketches entered in the 12th annual Architectural Lighting Competition sponsored by the New York Section of the Illuminating Engineering Society.

About 80 senior and graduate students from the schools of architecture at Columbia University and Pratt Institute participated in this competition. First prize of \$25.00 went to Harry B. Mahler of Columbia University. Second prize of \$15.00 went to R. L. Sutnar, and third prize of \$10.00 went to Frank Pisani, both of Pratt Institute.

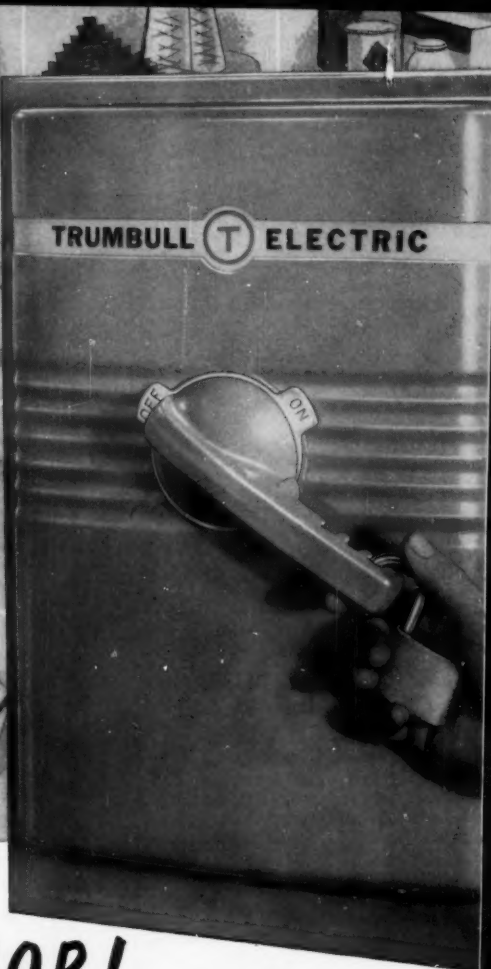
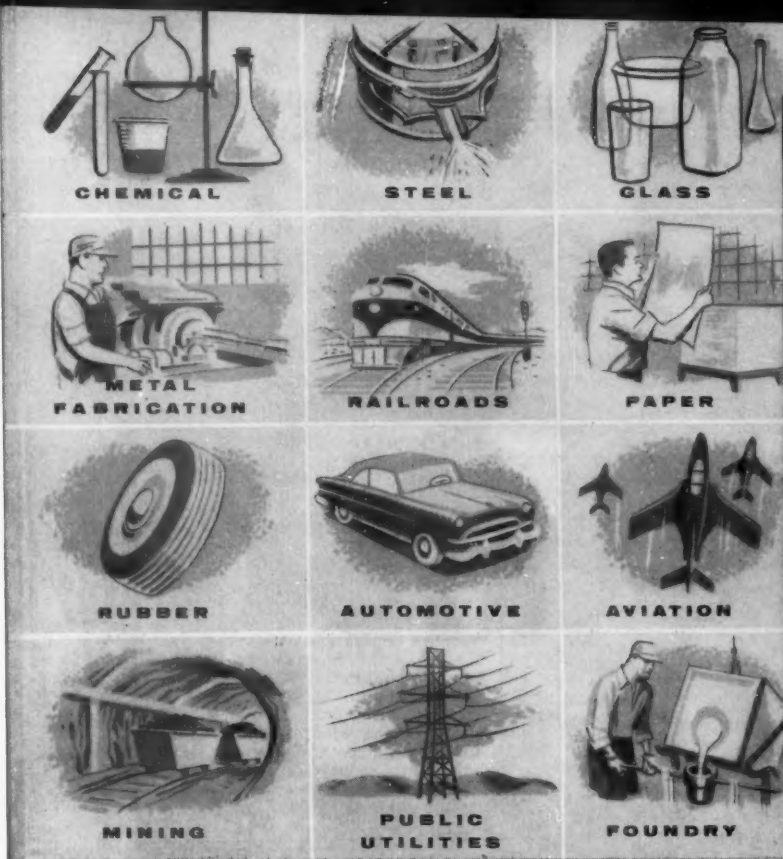
The problem presented for the students and approved by the schools as part of the teaching curricula was the architectural layout and lighting design of a small art gallery, to be constructed as an alteration to an existing structure on 57th Street, New York City. Prior to the actual solution of the problem by the student entrants in the contest, a lecture on the subject of museum and gallery lighting was given at each of the participating schools by Lawrence Harrison, illuminating engineer and consultant to the Metropolitan Museum of Art in New York City.

Judges for the competition were architects Walker D. Cain, of McKim, Mead & White, and J. Stanley Sharp, of Ketchum, Gina & Sharp, and Alex Sitkin, professional engineer, of Mongitore & Mosel, consulting engineers, all of New York City. A critique of the winning entries was presented by Mr. Sitkin at the time the awards were presented.

A review of the three winning entries showed an unusual appreciation for the integration of the lighting system into the structural details of the building, and a harmonious blending of light patterns with architectural details. Student Harry B. Mahler com-



**MICHIGAN CONTRACTORS** Andy Smith A. F. Smith & Son, Ypsilanti, and B. F. Wheeler, Burr Wheeler Electric Co., Kalamazoo, exchange business experiences



## PROVED ON THE JOB!

### Trumbull's New Approach to Switch Design

Style HCI incorporates basic improvements in safety switch design. Built to take *more* electrical punishment than your present loads will give it. Rugged enough to be as good as new years from now when its full capacity is needed. Successfully tested for use with current limiting fuses.

Revolutionary five years ago — today, proved on the job, coast to coast. Style HCI is the soundest investment you can make in switch safety, dependability and long range economy. For literature write General Electric Co., Trumbull Components Dept., 44-04 Woodford Ave., Plainville, Conn.

**Front Operated** for compactness. Both handle and cover can be locked, on or off, with a single padlock. If desired up to four padlocks can be used.

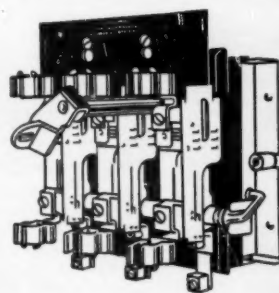
**G-E Pole Units** of exclusive circuit breaker arc quenching and heat dissipating design. Visible contacts. Quick make-quick break — will withstand heavy shorts.

**Line Shield** as standard feature — no exposed live parts

when switch is OFF. Quickly removable interiors and ample wiring space for easy installation and maintenance.

**Semi Dust Tight Enclosure (NEMA 1-A)** at no extra cost. Bonderite® treated for increased corrosion resistance. New 70% lighter Water-Tight and Dust-Tight lead plated enclosures available (NEMA 4 & 5). AMPERE RATINGS 30-60-100 & 200 fusible and no fuse.

**HCI Disconnect Switches** provide advantages for a wide range of product applications of the Original Equipment Manufacturer. Ideal for use in switchboard, panelboard and industrial control applications.



*Progress Is Our Most Important Product*

# GENERAL ELECTRIC

\* T. M. REG. PARKER RUST-PROOF CO.



"Service-Master saves me up to one hour of service time every day"



## Service-Master

### THE IDEAL ELECTRICAL CONTRACTING AND MAINTENANCE BODY

Service-Master is the body that takes a completely equipped shop to the job, and saves up to 60 minutes per day. Using the latest average service base rate of 6 cents a minute and an average saving of 30 minutes a day . . . Service-Master saves \$8.00 worth of time a year. Available in sizes for 1/2, 3/4, 1, and 1 1/2 ton chassis regardless of age or make. The coupon below will bring complete details, with no obligation to you.

### MAKE YOUR PICK-UP TRUCK A SERVICE TRUCK, TOO! SERVICE-TWINS

for 1/2 and 3/4 ton pick-up trucks



The easy-to-install tool and material compartments are finished in baked-on, gum-dark green enamel. Parts bins are 12 in. deep. Doors have slam-action catches, and locks keyed alike. Available with lead rack.

### CABE-POWERS AUTO BODY CO.

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Please send me complete details on:

SERVICE-MASTER ☐ SERVICE-TWINS ☐

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**FRANK CAMUS**, who for many years was active in the IAEI and is still close to electrical inspection interests, is shown here looking over plans on one of the many outstanding jobs which his electrical contracting firm, C & C Electric Co., Shreveport, La., are now running.

combined fixed and adjustable louvers under natural skylights so designed as to make maximum use of daylight and designed a multi-purpose unit which would serve as a socket for display stanchions or as spotlights. Another innovation of highly practical design was the design of flexible fluorescent and incandescent lighting units which could be suspended from the multi-purpose units in the ceiling to light wall displays, or statuary at any location on the floor of the display area.

Student R. L. Sutnar made good use of an electric raceway for carrying current and as a support for adjustable spotlights, used freely for dramatic lighting effects throughout. Wire mesh was ranged on one wall for displaying drawings with wall background painted white. Raceways suspended below in a grid pattern for maximum flexibility in locating spotlights.

Third prize sketch by student Frank Pisan: featured a luminous corrugated plastic ceiling in one display area, recessed troffers in office space and other display areas, and a combination of plastic luminous ceiling and adjustable spots for sculpture display.

## Louis Kalischer With Fischbach and Moore

Louis Kalischer, P.E., has been elected a vice president of Fischbach and Moore, Incorporated, New York. Mr. Kalischer, who has been active for many years in the industry, recently closed out his electrical contracting business in Brooklyn, N. Y.

In 1930 Mr. Kalischer received the James H. McGraw Award Contractors Medal for his plan for the electrical modernization of industry.

Slash Motor Maintenance  
Speed Installation  
Increase Brush Life  
Cut Motor Down Time



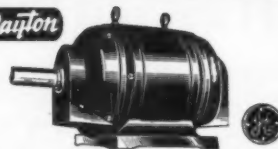
### MULTIFLEX brushes with NEOPRENE pads

... really protect your motor and generator investments. Engineered for better contact and reduced vibrations, Helwig Multiflex brushes eliminate uneven wear and reduce circulating current. Get multiple brush operation without expensive changes. The key to longer commutator life is a quality brush designed to FIT, instead of a cut-down, so-called standard brush. Save production time and money with Helwig tailor-made brushes. Write for details on the Helwig brush inventory control plan.

**HELWIG CO.** CARBON PRODUCTS  
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Next time you need motors from 1/100 to 60 HP., and other electrical items—save time and money—order from your Grainger Motor Book. You'll get fast shipping and pick-up service from your nearby Grainger Warehouse — and lowest possible prices always. Your Grainger Salesman is at your service too—let him help you. Grainger service can help you build sales—it has for thousands of dealers.

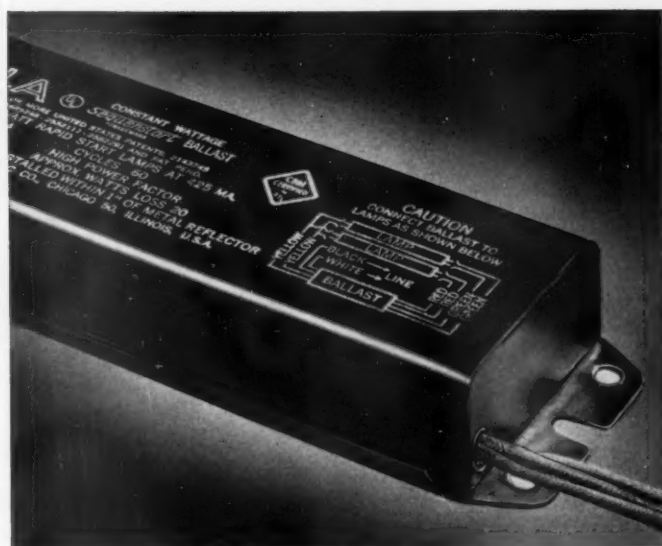
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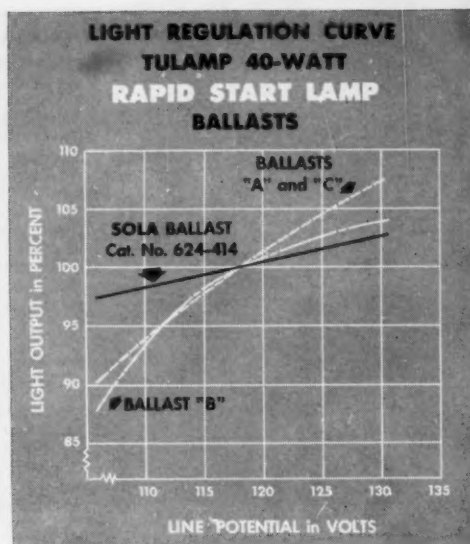


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48 WAREHOUSES—COAST-TO-COAST—SEE PHONE BOOK  
GENERAL OFFICE: 118 S. OAKLEY BLVD., CHICAGO 12





**LOW, COMPACT CASE** — Case height 1-13/16", length 8-5/16", width 3-1/8". Fits all standard, rapid-start channels. Weighs only 5-1/2 pounds. Leads are adequate length for easy hook-up without splicing, and clearly color-coded for quick identification. The case is permanently labeled and includes a wiring diagram and electrical ratings.



**CONSTANT LIGHT OUTPUT** — Light output characteristics of a typical Sola Constant Wattage Rapid-Start Ballast compared with three typical, non-regulated ballasts. Constant wattage is an exclusive premium feature in a ballast of this small size and light weight.

## Guarantee constant light output on rapid-start lighting systems with Sola Constant Wattage Ballasts

You design or specify a rapid-start lighting system to deliver a specific number of foot candles at a specific working surface. Your customer buys your system on the basis of that expected performance . . . but what happens to light output and lamp life when line voltage varies?

With ordinary, unregulated ballasts, lumen output and efficiency will drop significantly when line voltage drops . . . lamp life is shortened by line voltage surges. Sola Constant Wattage Ballasts maintain lumen output within  $\pm 2.5\%$  or less, with line voltage variation as great as  $\pm 10\%$  . . . lamp life is protected by regulation of lamp current.

In addition, they offer many other advantages: reliable starting, cool operation, self-protection against damaging heat rise when lamps fail, absolute safety when relamping, unusually quiet operation, compactness, light weight and moderate price.

You automatically guarantee all the light your customer expects when your rapid-start installation is ballasted with Sola Constant Wattage units. You guarantee your customer's satisfaction through continuous, dependable performance. Write for full information, or request a Sola sales engineer to call for all the facts.

Reduces relamping . . . keeps lumen output constant

**SOLA** *Constant Wattage*  
**BALLASTS**



WRITE FOR  
NEW  
RAPID-START  
BULLETIN 171-FL-199

CONSTANT VOLTAGE TRANSFORMERS for Regulation of Electronic and Electrical Equipment • LIGHTING TRANSFORMERS for All Types of Fluorescent and Mercury Vapor Lamps. • **SOLA ELECTRIC CO.**, 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • **NEW YORK** 35: 103 E. 125th St., Trafalgar 6-6464 • **PHILADELPHIA**: Commercial Trust Bldg., Rittenhouse 6-4988 • **BOSTON**: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • **CLEVELAND** 15: 1836 Euclid Ave., Prospect 1-6400 • **KANSAS CITY** 2, MO.: 406 W. 34th St., Jefferson 4382 • Representatives in Principal Cities

**COMPLETE LINE OF  
QUALITY FLUORESCENT  
AND  
SLIMLINE FIXTURES  
FOR EVERY REQUIREMENT...  
COMMERCIAL & INDUSTRIAL**

**BY  
WILEY**

Pioneers in Fluorescence  
Since its Inception

- Modern, functional designs to harmonize with any architectural motif.
- Stock fixtures adaptable for all lighting layouts.
- Units designed for quick, easy erection. A minimum of "on-the-job" assembly.
- Patented E-Z Servicer.
- District Sales Engineers available for prompt cooperation.

Designed and completely manufactured by **WILEY**, with ETL Certified Electrical Components.

For Full Information, write

**R&W WILEY, INC.**

Dearborn at Bridge St.  
Buffalo 7, N. Y.

Underwriters' Approved  
IBEW (AF of L) Label  
Fleur-O-Lier Certified Models

## DATES AHEAD

International Association of Electrical Inspectors—Southwestern Section, Elko, Nevada, September 13-15; Northwestern Section, Portland, Ore., September 23-25; Canadian Section, King Edward Hotel, Toronto, Ont., Canada, October 4-6; Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.

Illuminating Engineering Society—National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.

Canadian Electrical Manufacturers Assn.—Annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 22-24.

International Association of Electrical Leagues—Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.

Eastern Canada All Electrical Show—Show-Mart Exhibition Hall, Montreal, Quebec, Canada, October 6-10.

American Institute of Electrical Engineers—Fall general meeting, Morrison Hotel, Chicago, Ill., October 11-15.

New Jersey Council of Electrical Leagues—18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.

National Safety Congress and Exposition—Conrad Hilton Hotel, Chicago, Ill., October 18-22.

National Electrical Contractors Association—Annual convention, Jung Hotel, New Orleans, La., October 27-30.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, N. Y., January 31-February 4.

National Rural Electric Cooperative Assn.—Annual meeting, Atlantic City, N. J., February 14-17.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 13-18.

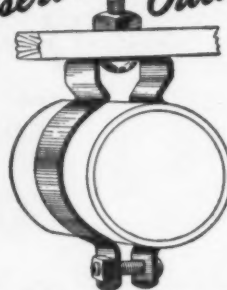


**CUSTOMER CONSIDERATION** and service are prime factors in any successful electrical contracting operation, believes Ernest P. Dixon, manager, Michigan Chapter, NECA. He urges his members to establish service facilities, then sell themselves and their service to prospective customers.

## MINERALLAC

Steel HANGERS, CLIPS, STRAPS

*Outserve! Outlast!*



Minerallac Cable, Conduit and Messenger Hangers are **STEEL**. Easier, quicker to install; permit speedy, compact wiring; economical. Also in Everdur... Porcelain Insulating Bushings available.

Heavy **STEEL** Clips (Pipe-clamp) require only one screw, nail or bolt; rib-strengthened; for hanging pipe, conduit, BX cable, mounting coils, etc. Millions in use.

Steel Straps for Messenger-cable services on outlet boxes; may be used in conjunction with hangers.

Order from your Electrical Wholesaler. Send for literature.

**MINERALLAC ELECTRIC COMPANY**  
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*We have 'em!  
... 6 SIZES*

**K&H  
UNIVERSAL PRESSURE TYPE  
ADJUSTABLE LUGS**

*One or two bolt holes*

Wire sizes Nos. 14 to 1,000,000 CM. One-piece construction—easily installed. Body is well proportioned to withstand excessive use, with ample thread area. Makes tenacious grip on stranded conductors, forcing contact with each wire in strand, thereby insuring utmost in conductivity—bottom of tongue surface is ground. Not susceptible to release under vibration.

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WALTER D. VANCE, JR., Vice President • California Electric Co., reports:

**"We saved 14 days installing  
527 fixtures by using  
'UP-RIGHT' Scaffold-on-Wheels"**

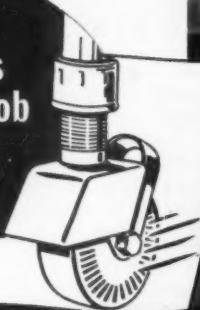
Man-hour savings on this General Motors warehouse job amounted to over 40%. Up-Right Scaffold is so light it is easily assembled by one man. Individual 1 piece aluminum alloy sections are unfolded and set one on top of the other. They lock into place instantly.

**14' tower  
assembled in  
2 minutes**

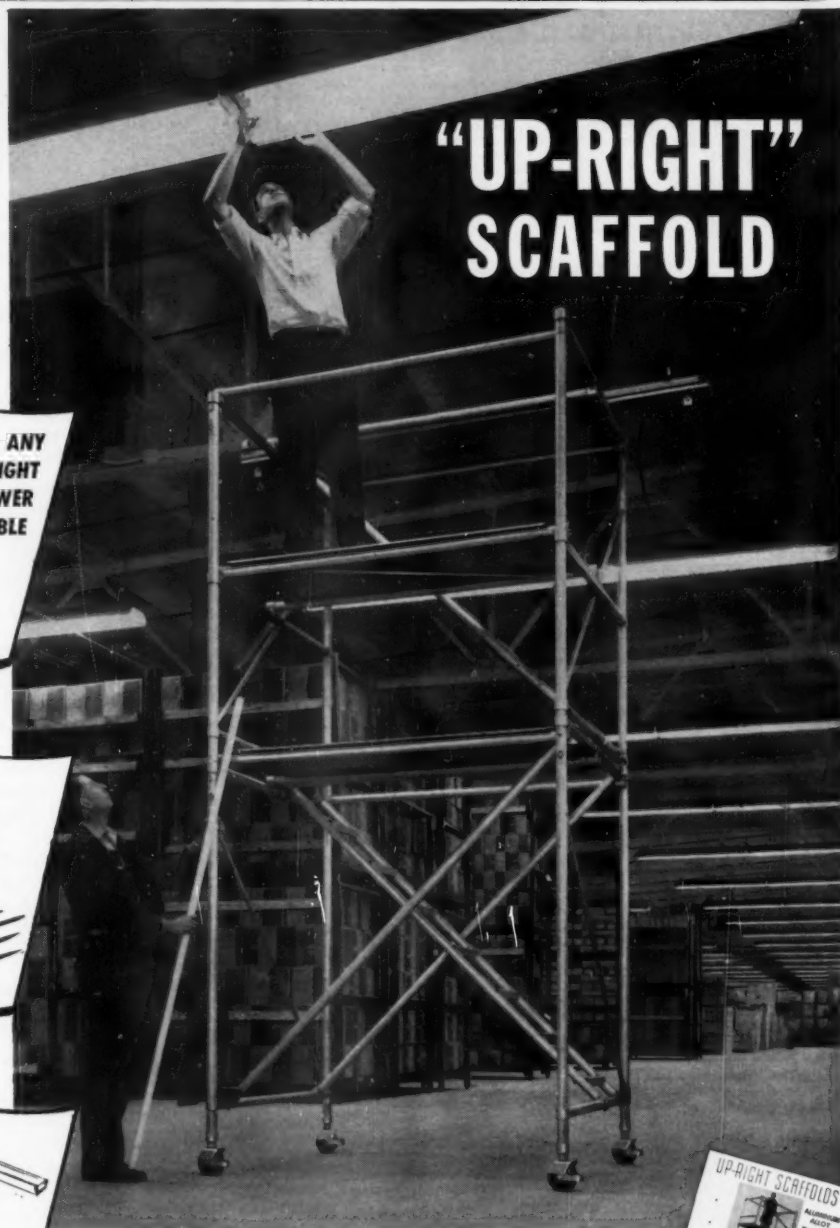
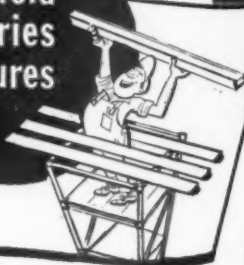


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ELECTRIC MFG. CO. CHICAGO, U.S.A.

## 15° HORIZONTAL FLUORESCENT PUMP ISLAND LIGHTERS

**Provide Increased  
BRIGHTNESS AND MORE FEATURES**



Luminaire mounted on Revere 204-C Pole, providing an excellent means for modernizing old Island Lighters at moderate cost.

Superior to conventional "tilted" flat panel luminaires. Redistribution of down light to useful areas increased as much as 390%. "End-on" illumination increased as much as 500%—giving pump islands more even pattern of light.

This Fixture typifies another forward step by Revere in Gas-Station illumination. Surface brightness is greater for more attractive nighttime appearance, but is not glaring. Plastic shield mounted in special rolled aluminum channel lens frame for utmost rigidity. Continuous hinge assures a light-tight cover. Available in 4 and 8 foot instant start fluorescent and 8 foot slimline.

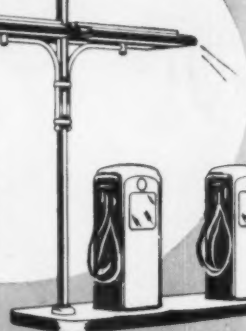
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6017 Broadway • Chicago 40, Ill.

INDOOR AND OUTDOOR LIGHTING FOR EVERY NEED

Showing Luminaire mounted on Revere Hinged Pole two to an island. Note streamlined appearance giving Pump Island (the point of sale) real eye-catching appeal.



**BUSY MAN** these days is M. Korenblat, who, with his brother A. I. Korenblat, heads up electrical contracting and retail electrical sales of I. K. Electric Co., Little Rock, Arkansas.

## Memphis Service Shop Rewinds Hermetics

Egle-Trobaugh Electric Co., electrical service specialists of Memphis, Tenn., has set up specialized procedures for repairing and rewinding hermetically sealed air conditioning motors. Company officials state that they have devoted four years to perfecting methods and in the research of special materials compatible with the gases used in such equipment and are now prepared to handle this type of work on a large scale.

## NISA News

Los Angeles Chapter held regular meeting on August 10 at Rodger Young Auditorium. William Hogue, Past President of NISA, delivered report on Detroit convention.

Plans for the forthcoming national convention in Los Angeles next year were discussed at this meeting.

• • • • •

Charles A. Buckley of Buckley Electric Motor Co., Atlantic City, N. J. has gone into semi-retirement and has turned over active management to his son-in-law, Walton T. Gibson.

• • • • •

Keith M. Noble has been named secretary of Pacific Electric Motor Co. Inc., Oakland, Calif.

• • • • •

John D. Hilburn, Boese-Hilburn Electric Co., Kansas City, Mo., was elected president of National Appliance Service Association at the group's recent national convention in Cincinnati. He served as vice president the

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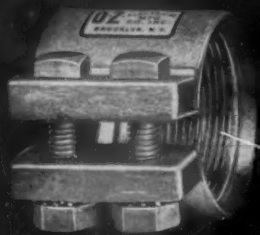
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# "TOUGH" conduit coupling jobs

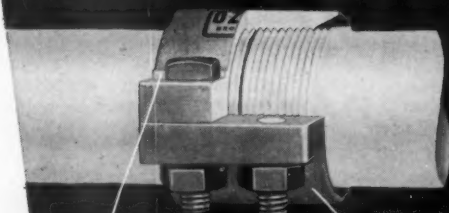


(Type "SP")

Interior thread meshes with conduit threading for rigid, tight-fitting connection.

## are easy with O.Z.

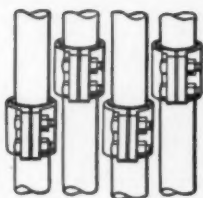
## split couplings



Bolt heads are held in place by shoulder on coupling, eliminating need for second tool.

One piece malleable iron construction facilitates handling during installation.

To install, simply slip over one conduit end, butt ends of both conduits, slide fitting back into position and tighten nuts.



\* "Tough"—(Where ordinary couplings can't be installed). Are clearances close—near floor, wall, ceiling or other obstructions? Can conduits be turned due to bends? Is space or accessibility a factor? Just install an O.Z. Type "SP" Split Coupling.

Butt the conduit ends within the O.Z. Split Coupling—tighten two nuts with an ordinary open-end wrench and presto . . . you have a permanent, close-fitting, rigid connection.

Drastically reduced installation costs, plus initial savings of as much as 50% in larger sizes, over similar competitive fittings, are just two of the many reasons why you should specify O.Z. Split Couplings for your difficult conduit coupling jobs.

Call your local O.Z. distributor . . . he is ready to make immediate delivery from stock on sizes from ½" to 5".

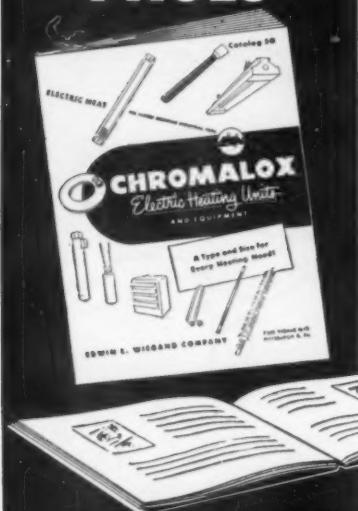


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last two years and as a member of the board of directors since NASA's founding in 1948.

NISA Member Larsen-Hogue Electric Co., Los Angeles, was one of the exhibitors at the Western Plant Maintenance Show held in Los Angeles in July. Its exhibit included stators insulated with Epoxylite. A coil, also insulated with the new type resin, was shown immersed in boiling lye. After 24 hours, the resistance still registered zero.

T. M. Harris, Egle-Trobaugh Electric Co., Memphis, was the designer of the live center for pulley puller which won second prize of \$75 in the 1954 Award Contest. Carl D. Bonner of the same firm, who was credited with the idea in the July issue of NISA NEWS, acted as draftsman for Harris' entry.

Quaker City Chapter had 122 persons at its summer social meeting June 25 at Philadelphia's Lu Lu Temple Country Club in the suburbs. Retiring president Samuel Augustine, Electric Motor Specialty Repair Co., Reading, Pa., was given a traveling bag by the chapter. Door prizes were distributed among the guests.

Northern California Chapter met June 7 at Olympic Club in San Francisco with 15 members and two guests present. Kenneth Anderson of Dow Corning Corp. showed a film on silicone uses and applications, followed by a brief talk and a question-and-answer period.

Great Lakes Chapter elected new officers June 21, just a few days after the 1954 Convention was concluded. President is Charles E. Smith, J. E. Berger Corp., Detroit; vice-president, Earl E. Kuchman, Detroit Electric



**TWO TEXANS**, shown here after just finishing up a residential modernization job, are O. K. Chapman (left) and G. W. Ford, electricians with Metcalfe Electric Co., Ft. Worth, Texas.

Motor Works, Inc., Hazel Park, Mich.; secretary, James Spaulding, Spaulding Electric Co., Detroit; and treasurer, Charles H. Howard, Howard Electric Co., Detroit. New officers will serve through 1955. Charles J. Cannon, Nimmo Electric Co., Detroit, and Howard were elected to a two-year term on the chapter board of directors. Regular meetings will begin again in October, and a picnic for members and their families is planned for September at the Cannon cottage on Whitmore Lake.

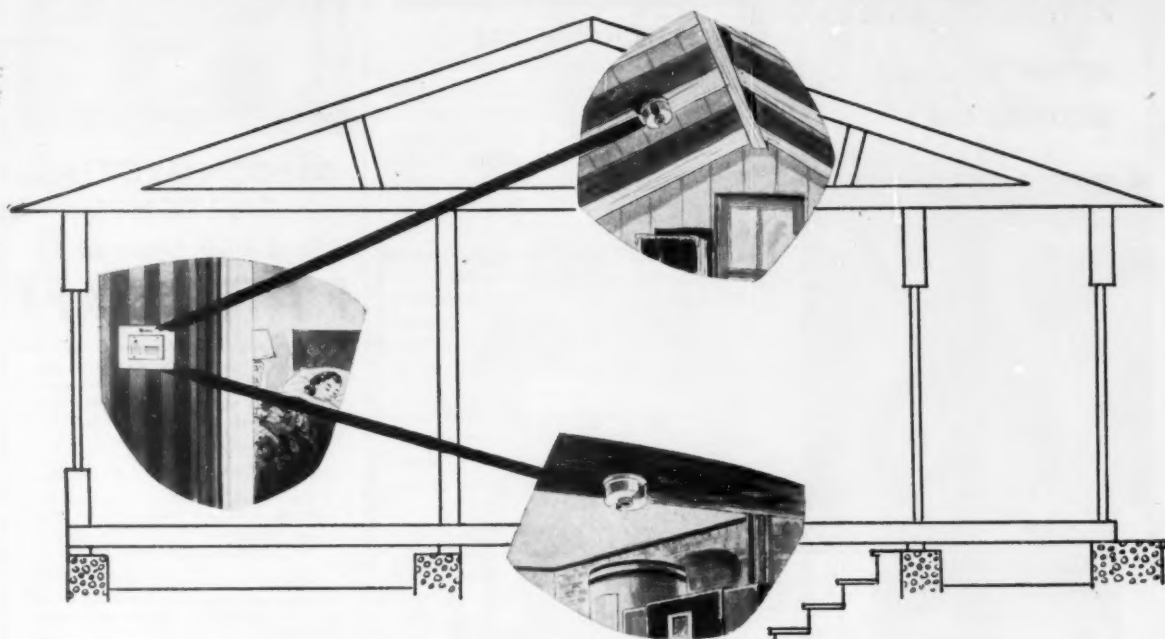
New England Chapter, meeting July 1 at Hotel Bradford, Boston, heard a report of the Detroit Convention from several members who attended. A buy-and-sell session produced five inquiries to buy and none to sell.

From Walter J. Prise, Queens Electric Motors Inc., Jamaica, N. Y.



**\$8 1/2-MILLION BRIDGE** over New Jersey's Hackensack River involved extensive electrical work by Lightning Electric Company in connection with vertical lift motors, controls, submarine feeders and lighting. Rapidly nearing completion, the bridge recently was inspected simultaneously by (left to right) Winn Rose, Lightning superintendent; Jerry Ianaccho, supervisor for the New Jersey Bridge Division; Jack Koffler, resident engineer for the Bridge Division; Charles Foster, general foreman from Local 164, and Les Gower, another Lightning superintendent.

**Terrific new chance for extra profits...**



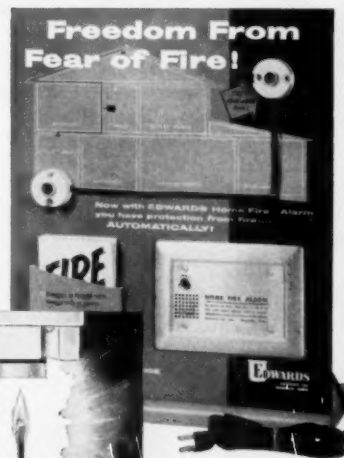
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## Book Reviews

### Plant Maintenance

A comprehensive report on the latest methods of plant maintenance, prepared by outstanding authorities in this field, is contained in a 300-page (8½ by 11 inches) volume titled "Techniques of Plant Maintenance and Engineering—1954". This book includes the complete proceedings of the technical sessions held concurrently with the 5th national Plant Maintenance and Engineering Show which was held in Chicago earlier this year. Besides presenting all papers delivered at the conference, the book also includes a complete transcript of the questions and answers that followed each session, and it likewise carries extensive summaries of 20 roundtable discussions on special problems related to the maintenance field.

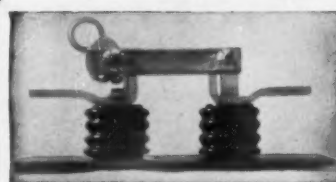
The scope of the discussions is extensive, including expositions on such topics as Planning and Scheduling Maintenance Work (in plants of 1000 employees and in shops with 150 men); the Pros and Cons of Preventive Maintenance; Training People for Maintenance Work; Organizing People, Policies and Procedures for Effective Maintenance; Maintenance by Area Compared with Centralized Maintenance; Work Measurement, Standards and Incentives; Getting Management's O.K. on the Maintenance Program; Problems Met in Handling Maintenance Labor, and Maintenance Cost Control.

Round-table discussions cover such subjects as Inspection and Upkeep of Electrical Distribution Systems.

Published by Clapp & Poliak, Inc., 341 Madison Avenue, New York, N. Y., the volume (5th in a series dating back to the proceedings of the 1950 conference is bound in tan fabric-board, is cover-lettered in gold, and is priced at \$7.50).



**EARL FISK**, Little Rock, Arkansas, is the popular, hard-working manager of the Arkansas Chapter of the National Electrical Contractors Association.



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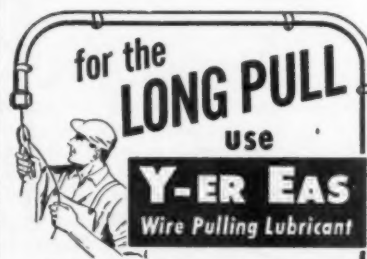
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# Among the Manufacturers

## Headquarters Announcements

Redmond Co., Inc., Owosso, Mich.—Charles W. Frost, chairman of the board; J. W. Tweedy, president.

Edwards Company, Norwalk, Conn.—Thomas S. Nolan, executive vice president.

Tilden Tool Mfg. Co., San Clemente, Calif.—R. H. Pollock, sales manager.

Allen B. DuMont Laboratories, Inc., Clifton, N. J.—Keeton Arnett, vice president, administration.

United States Air Conditioning Corp., Minneapolis, Minn.—David E. Feinberg, president.

National Carbon Co., New York, N. Y.—C. J. Chapman, general sales manager, industrial products.

Weller Electric Corp., Easton, Pa.—Joseph F. Whitaker, vice president, sales.

Stoddard Industries, Inc., Chicago, Ill.—Ford Stoddard, president; Robert Stoddard, vice president of this new firm to manufacture electrostatic filters.

Beaver Pipe Tools, Inc., Warren, Ohio—Charles T. Everett, executive vice president and general manager.

Joy Manufacturing Co., Pittsburgh, Pa.—John Lawrence, executive vice president.

Howard Electric Co., Chicago, Ill.—R. F. Becker, national sales manager.

Wagner Electric Corp., St. Louis, Mo.—George W. Brown, vice president.

General Electric Co., Schenectady, N. Y.—Fred J. Borch, vice president, marketing.

Mercer-Robinson Co., Inc., New



**EXECUTIVE VICE PRESIDENT** of Fagan Electric Co., Little Rock, Arkansas, is Floyd Sharp who keeps track of the many administrative details of the firm's large scale contracting and motor repair activities.

# Mark of a Modern Home

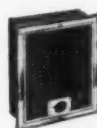


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York, N. Y.—J. F. Fritts, executive vice president.

Williams Mfg. Co., Sealelectric Division, Chicago, Ill.—Ford SeBastian, vice president and general manager.

Westinghouse Electric Corp., Staunton, Va.—Milton S. Angier, heat pump product manager, air conditioning division.

Moloney Electric Co., St. Louis, Mo.—Edward F. Classen, Howard D. Tindall, and Donald E. Spackler, vice presidents.

Federal Electric Products Co., Newark, N. J.—merged with Pacific Electric Manufacturing Co. under the name Federal Pacific Electric Co.

### Regional Appointments

#### NEW ENGLAND

D. W. Onan & Sons Inc.: Charles J. Helmholtz, direct factory sales engineer.

General Electric Co.: A. P. McGraw, sales manager for Distribution Assemblies and Trumbull Components Departments in New England and upper New York.

#### MIDDLE ATLANTIC

Micro Switch Division of Minneapolis-Honeywell Regulator Co.: John K. Lincoln, sales manager for all states east of the Rockies.

Sterling Electric Motors, Inc.: Richard L. Bedell, branch manager of Rochester, N. Y. office.

New England Carbide Tool Co., Inc.: Fred Driscoll, manager of new sales and distribution office in New York City.

#### SOUTH ATLANTIC

Graybar Electric Co., Inc.: W. C. John, manager, Roanoke, Va. branch.



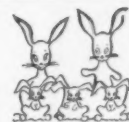
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General Electric Co.: A. T. Allison, sales manager for Distribution Assemblies and Trumbull Components Departments in southeastern states.

### EAST CENTRAL

Moloney Electric Co.: Harry S. Thomas, manager of new district sales office in Chattanooga, Tenn.

General Electric Co.: R. E. Hixson, manager of lamp division sales in Iowa, Ill.; G. T. Myers, sales manager in north central states for Distribution Assemblies and Trumbull Components Departments.

John A. Roebling's Sons Corp., E. F. Whitehill, Cleveland district manager, Wire and Cold Rolled Products Division.

Permacel Tape Corp.: Ralph A. Selle, midwestern manager.

Graybar Electric Co.: E. N. Cundiff, Toledo, Ohio, branch manager.

### WEST CENTRAL

Rodale Mfg. Co., Inc.: Doug Gale, sales representative for Kansas, Iowa, Nebraska, and western Missouri.

Moloney Electric Co.: F. J. Connell, St. Louis district sales manager.

General Electric Co.: Neal F. Harman, southwestern regional manager for communication equipment.

### WEST

Westinghouse Electric Supply Co.: Martin B. Sauer, sales manager for consumer products.

John A. Roebling's Sons Corp.: R. J. Cole, Pacific Coast manager of the Construction Materials Division.

National Supply Co., Spang-Chalfant Division: J. H. Stumph, conduit representative for northwestern states.

United States Rubber Co.: Arthur A. Gingell, wire and cable sales representative at San Francisco branch.

Minneapolis-Honeywell Regulator Co.: R. B. Grant, Los Angeles branch manager.

Radio Receptor Co., Inc.: Martin Mann, sales representative for southern California and Arizona.



MANAGER LLOYD "LUBE" YOUNG and superintendent Hollis Anderson of East Side Electric, Klamath Falls, Ore., cover a large electrical field, territorially as well as electrically.

# WHERE To BUY

Equipment, Materials,  
Supplies and Services for  
Electrical Construction—  
Maintenance—Repairs

## A TRADE-MARK



## YOU CAN RELY ON

Backed by more than 15 years experience in transformer design and manufacture.

HINDLE TRANSFORMER CO., INC.

Woods Church Road, Flemington, N. J.

## STOP that WATER

With FORMULA NO. 640, a clear liquid which penetrates 1" plus in concrete, brick, stucco, plaster, etc. Seals out water, dirt. Holds 20' head. Use outside and in. Preserves all absorbent materials. Sold 14 years. Quick, economical, sure. \$3 in 55's. Free sample. See Sweet's. HAYNES PRODUCTS CO., OMAHA 3, NEBR.



## LINDELL BORING ATTACHMENT

Fast, easy boring  
Drill attachment for  
easy boring in hard to  
reach places, overhead  
or below without ad-  
justing.

Fits any 1/2" drill.  
Reduced speed for more  
power.

At your jobber, or write.

LINDELL ELECTRIC  
115 East 58th Street  
Minneapolis 19, Minn.

## ROBOT OPERATORS

OPEN - CLOSE - LOCK DOORS, GATES

... Electronically

COMMERCIAL, INDUSTRIAL

RESIDENTIAL & SPECIAL

Write for Catalog

ROBOT APPLIANCES, INC.

7041 ORCHARD - DEARBORN, MICHIGAN

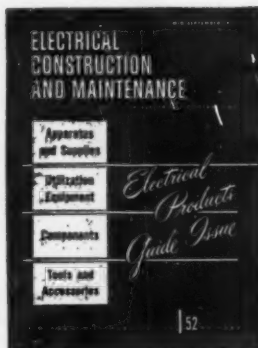
## A GOOD Habit

The Where-To-Buy Section of Electrical Construction and Maintenance supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue—a good habit!



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• These manufacturers advertised their products in the **ELECTRICAL PRODUCTS GUIDE**

For more complete information, and application data on their lines, refer to the Index of Advertisers in the **ELECTRICAL PRODUCTS GUIDE** . . . the 13th issue of **ELECTRICAL CONSTRUCTION AND MAINTENANCE**.



# THIS COMPLETE LINE MEETS EVERY NEED FOR PUSHBUTTONS



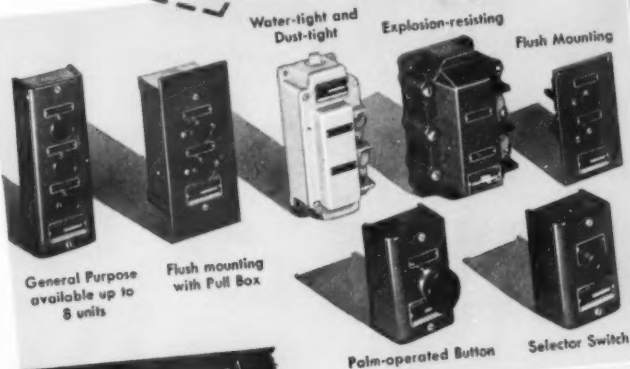
DESIGN  
LEADERSHIP

## STANDARD DUTY



Name your pushbutton requirement—there's a Square D unit to do the job, exactly. Three complete lines . . . standard duty, heavy duty, and oil-tight heavy duty . . . each providing a wide range of operators, stations, and circuit combinations.

## HEAVY DUTY



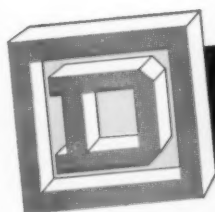
Write for Pushbutton Bulletins which give complete details. Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

## OIL-TIGHT HEAVY DUTY

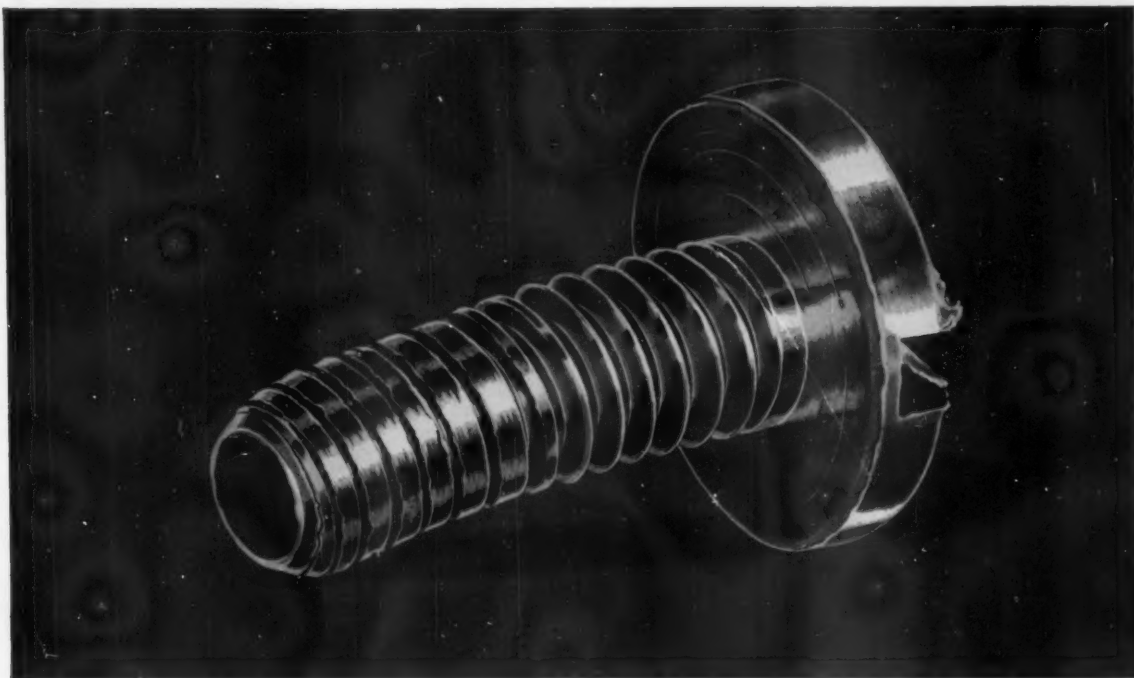
Available in 1 to 16 unit sizes. 6-9-12-16 unit stations have hinged covers for easier wiring



ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

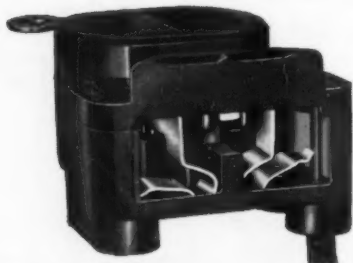


# SQUARE D COMPANY



# A cause of failure... now removed

New G-E wiring devices eliminate binding screws



## HOW GE3800-LINE DEVICES WORK

Sturdy locking springs hold the *entire* stripped length of the wires securely inside contact channels as shown in the cutaway view above. These connections withstand a pull-out test of over 75 pounds with No. 14 Awg wire. Equally strong (and equally easy) connections are made with No. 12 and No. 10 Awg wires. Vibration won't loosen connections—yet, when necessary, the wires can be released by inserting a screwdriver in the release slots. All live parts are completely enclosed to avoid shocks and short circuits.

### ASK YOUR G-E CONSTRUCTION MATERIALS DISTRIBUTOR

to demonstrate how GE3800-line outlets, switches, and lampholders with pressure-lock terminals provide

- EASIER CONNECTIONS
- BETTER TERMINATION
- PROTECTION AGAINST BREAKAGE

- Avoid stripped threads and breakage
- Just push in the wires to connect

It's so easy to mangle binding screw threads when working with No. 12 or No. 10 Awg wire—and when this happens you usually have to scrap the whole device. *Now* you can prevent this waste by using the new GE3800-line outlets, switches, and lampholders with pressure-lock terminals. They have *no binding screws*—and they are amazingly easy to wire. You just strip the insulation off the wires and push them into the terminal holes. There are no screws to loosen or tighten . . . no looping or bending of wires . . . no danger of connections vibrating loose. These devices mount easily in the box because the wires run straight out of the back.

GE3800-line devices with pressure-lock terminals are available in both standard and intermediate grades. All are listed by Underwriters' Laboratories, Inc., and meet Federal Specifications. Write for a free folder on this new wiring development. Section D127A-918. Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**